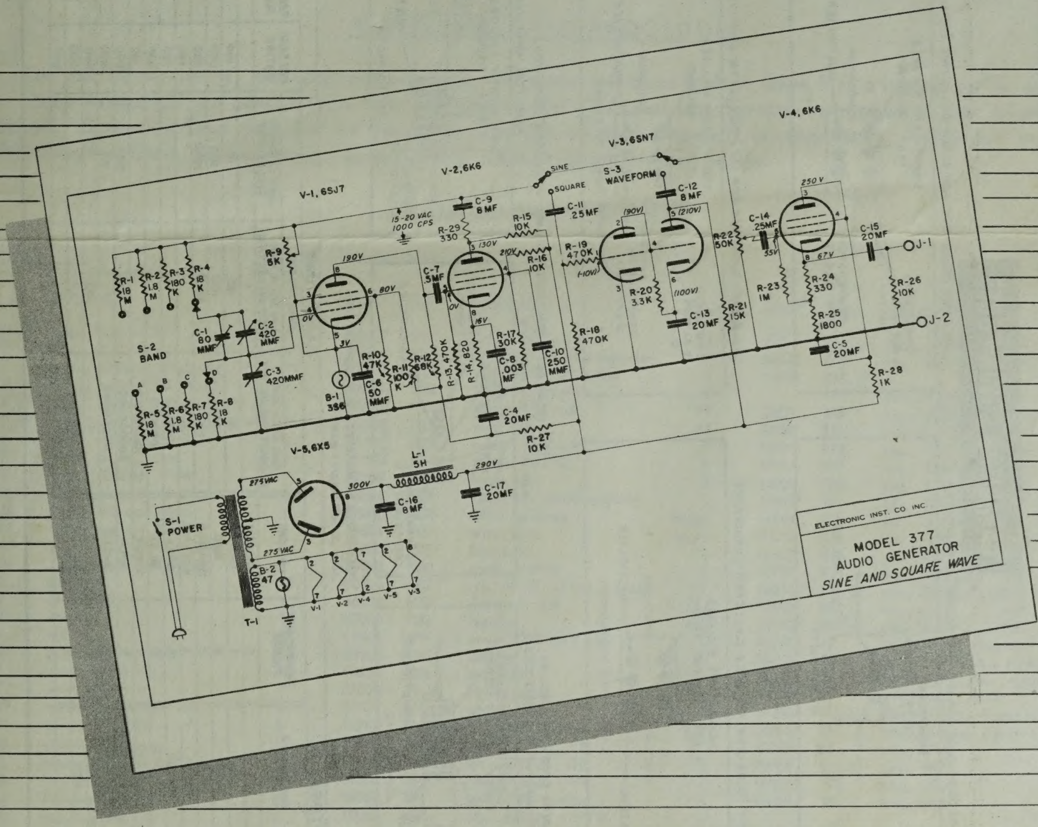
EICO

# CONSTRUCTION MANUAL

## Model 377

MODEL 377-1

# AUDIO SINE AND SQUARE WAVE GENERATOR

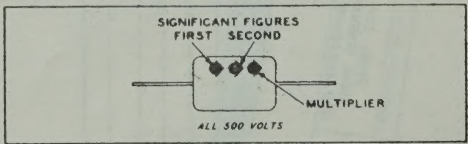



EICO Reg. U. S. Pat. Off.

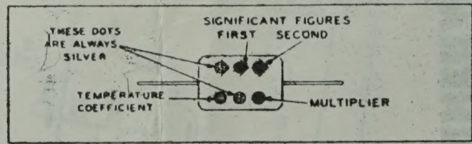
ELECTRONIC INSTRUMENT CO., Inc.

# CAPACITOR COLOR CODES

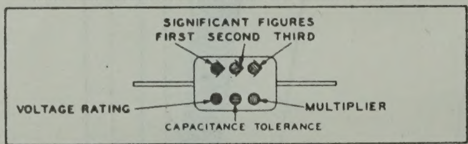
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



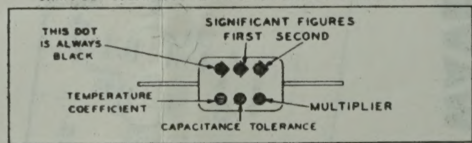

JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



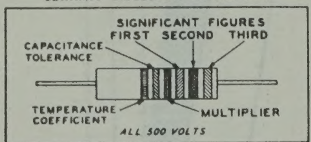

RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS




JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

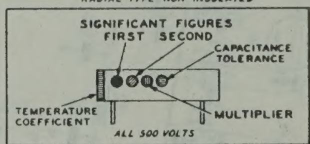



RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

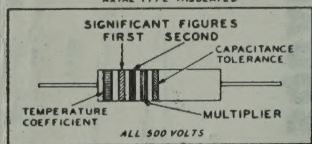



JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED




AXIAL TYPE INSULATED



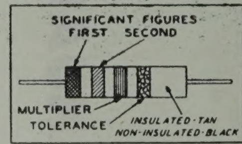

RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

| RESISTORS | | CAPACITORS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | MULTIPLIER | | | | |
| TOLERANCE | MULTIPLIER | SIGNIFICANT FIGURE | COLOR | RMA MICA AND CERAMIC-DIELECTRIC | JAN MICA AND PAPER-DIELECTRIC | JAN CERAMIC DIELECTRIC | VOLTAGE RATING | TEMPERATURE COEFFICIENT |
| | 1 | 0 | BLACK | 1 | 1 | 1 | | A |
| | 10 | 1 | BROWN | 10 | 10 | 10 | 100 | B |
| | 100 | 2 | RED | 100 | 100 | 100 | 200 | C |
| | 1,000 | 3 | ORANGE | 1,000 | 1000 | 1000 | 300 | D |
| | 10,000 | 4 | YELLOW | 10,000 | | | 400 | E |
| | 100,000 | 5 | GREEN | 100,000 | | | 500 | F |
| | 1,000,000 | 6 | BLUE | 1,000,000 | | | 600 | G |
| | 10,000,000 | 7 | VIOLET | 10,000,000 | | | 700 | |
| | 100,000,000 | 8 | GRAY | 100,000,000 | | 0.01 | 800 | |
| | 1,000,000,000 | 9 | WHITE | 1,000,000,000 | | 0.1 | 900 | |
| 5 | 0.1 | | GOLD | 0.1 | 0.1 | | 1000 | |
| 10 | 0.01 | | SILVER | 0.01 | 0.01 | | 2000 | |
| 20 | | | NO COLOR | | | | 500 | |

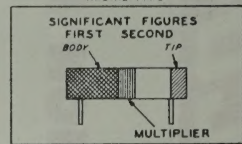
# RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

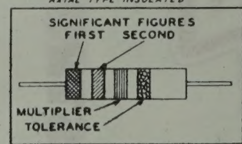



RADIAL TYPE

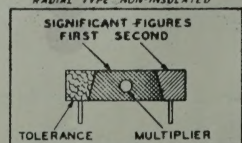



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED




RADIAL TYPE NON-INSULATED



# GENERAL INSTRUCTIONS

1) The Model 377 Audio Generator is constructed very easily with the aid of fully detailed perspective drawings and step-by-step instructions. Before starting the actual construction, it is advisable to study the schematic and pictorial wiring diagrams until all of the steps are clear in your mind. Do not rush the construction, as careful work will result in a properly constructed instrument in the shortest time. In addition, it is suggested that you run all leads exactly as shown on the pictorial wiring diagrams, as this will make the wiring an easier job and insure proper operation of the instrument.

2) USE A GOOD GRADE OF ROSIN CORE SOLDER ONLY. UNDER NO CIRCUMSTANCES USE ACID CORE SOLDER OR ACID FLUX inasmuch as the acid flux can cause serious corrosion. Before soldering, make certain there is a good mechanical connection. The solder must flow before you remove the soldering iron as this will prevent rosin joints which are poor electrical conductors. If you are soldering close to a part, hold the ends of a pair of longnose pliers between the part and the solder joint. The pliers will conduct the heat away and prevent the component from being unduly overheated.

3) Carefully unwrap all the parts and check them in the space provided on the parts list. Note: In order to maintain the supply of kits and insure prompt delivery, we are forced to buy the same component from several sources (standard manufacturers' parts are interchangeable). You may find that the value of a component will vary within the allowable circuit tolerance. This means a resistance of 470,000 ohms may be substituted for, or may measure 510,000 ohms, etc. Any part supplied will work as well as the part for which it was substituted. No substitutions will be made on precision components.

# CONSTRUCTION PROCEDURE

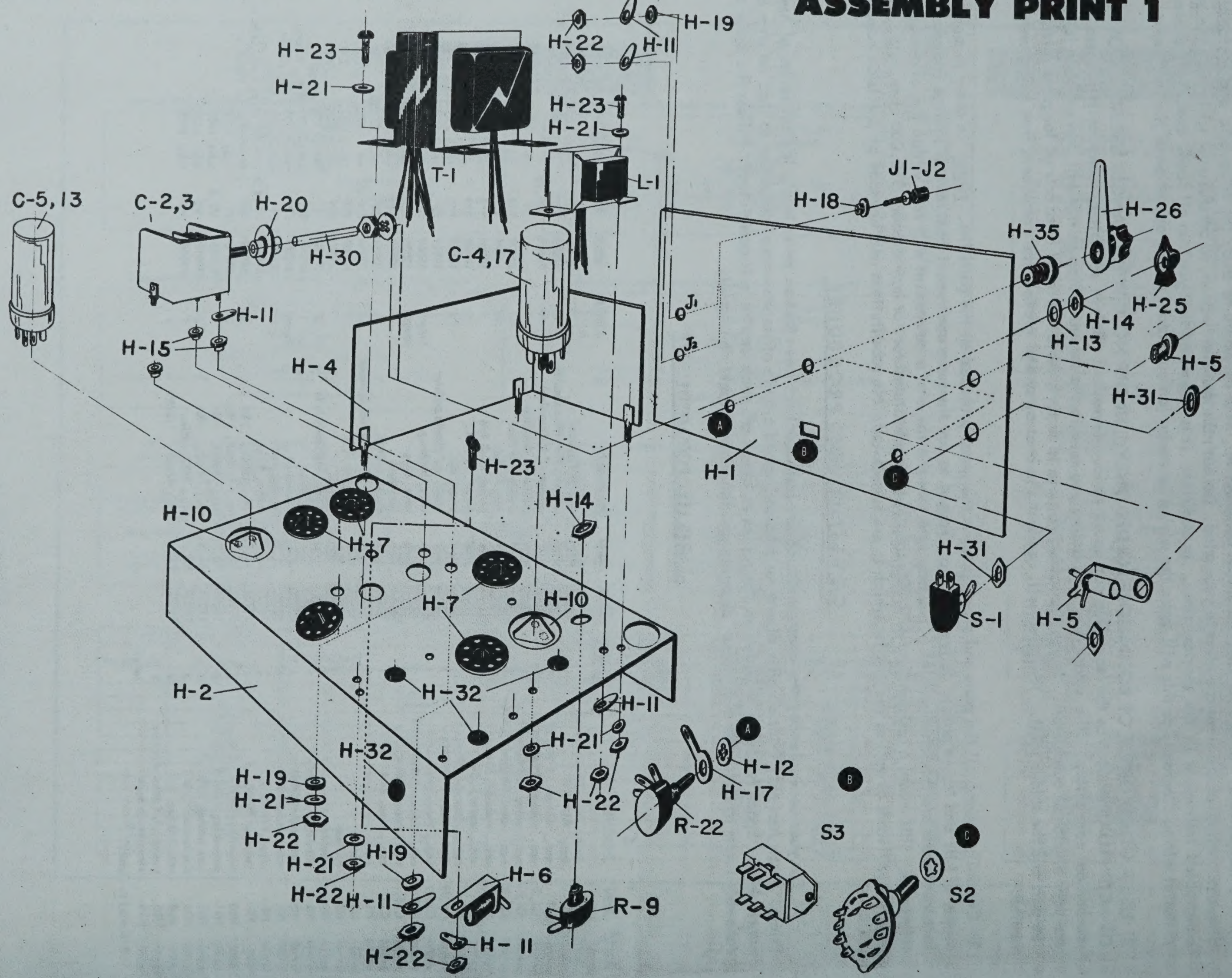
For your convenience, the construction of the instrument has been broken down into a logical series of Assembly Prints. Each Assembly Print consists of a detailed drawing and a table of step-by-step instruction so that no step can be overlooked. Space has been provided on the tables to check off each step as it is completed. Follow the order of the Assembly Prints to finish the mechanical assembly and the wiring quickly and easily.

## PARTS LIST FOR MODEL 377

| Stock# | Sym. | Description | Am't. |
|---|---|---|---|
| 92001 | B1 | lamp, 3S6 - 3W | 1 |
| 92000 | B2 | lamp, #47 | 1 |
| 29507 | C1 | cap., trimmer, 5-80 mmf | 1 |
| 29005 | C2,3 | cap., tuning, 2X420 mmf | 1 |
| 24001 | C4,17 | cap., elec. 2X20 mf-450V | 1 |
| 24001 | C5,13 | cap., elec. 2X20 mf-450V | 1 |
| 22000 | C6 | cap., ceramic, 50 mmf | 1 |
| 20005 | C7 | cap., paper, .5 mf | 1 |
| 20007 | C8 | cap., .003 mf paper, | 1 |
| 23002 | C9,12 | Cap., elec. 8mf-350V | 2 |
| 21001 | C10 | cap., 270 mmf, mica | 1 |
| 20004 | C11,14 | cap., paper, .25 mf | 2 |
| 23004 | C15 | cap., elec. 20 mf-150V | 1 |
| 23005 | C16 | cap., elec. 8 mf-450V | 1 |
| 80040 | H1 | panel | 1 |
| 81061 | H2 | chassis | 1 |
| 88002 | H3 | cabinet | 1 |
| 81013 | H4 | shield | 1 |
| 97700 | H5 | pilot light assembly | 1 |
| 97705 | H6 | lamp socket (3S6) | 1 |
| 97003 | H7 | octal socket * | 5 |
| 41016 | H8 | screw, #4-40x 1/4 | 2 |
| 40007 | H9 | nut, hex #4-40 | 2 |
| 59500 | H10 | mounting plate * | 2 |
| 43000 | H11 | ground lug | 6 |
| 42000 | H12 | lock washer, 3/8 | 4 |
| 42001 | H13 | flat washer, 3/8 | 2 |
| 40001 | H14 | nut, 3/8 hex | 4 |
| 42006 | H15 | washer, 1/4 fibre shoulder | 3 |
| 58500 | H16 | wire, heavy bare | length |
| 43001 | H17 | lug, 3/8 ground | 1 |
| 42006 | H18 | washer, 1/4 fibre shoulder | 2 |
| 42003 | H19 | washer, 1/4 fibre flat | 4 |
| 83000 | H20 | insulated coupling | 1 |
| 42002 | H21 | washer, #6 lock | 17 |
| 40000 | H22 | nut, #6 hex | 15 |
| 41000 | H23 | screw, #6 X 1/4 | 7 |
| 41002 | H24 | screw, #6 P.K. | 9 |
| 53000 | H25 | knob, bar | 2 |
| 53500 | H26 | knob, w/ plastic pointer | 1 |
| 58000 | H27 | wire, hook-up | length |
| 58501 | H28 | wire, bare | length |
| 57000 | H29 | line cord | 1 |
| 82000 | H30 | shaft, 1/4" D | 1 |
| 40003 | H31 | nut, 15/32" D hex & round | 2 |
| 46000 | H32 | grommet, 3/8 | 4 |
| 87000 | H33 | handle | 1 |
| 41001 | H34 | screw, #10-24 X 1/4 | 2 |
| 85000 | H35 | bushing | 1 |
| 58300 | H36 | spaghetti | length |
| 52000 | J1,2 | binding post | 2 |
| 34000 | L1 | choke, 5 Hy. | 1 |
| 11702 | R1,5 | res., 18MΩ, 1% | 2 |
| 11053 | R2,6 | res., 1.8MΩ, 1% | 2 |
| 11054 | R3,7 | res., 180KΩ, 1% | 2 |
| 11055 | R4,8 | res., 18KΩ, 1% | 2 |
| 18009 | R9 | pot., 5KΩ ,min. | 1 |
| 10022 | R10 | res., 47KΩ, 1/2W | 1 |
| 10811 | R11 | res., 100KΩ, 1W | 1 |
| 10023 | R12 | res., 68KΩ, 1/2W | 1 |
| 10028 | R13,18 19 | res., 470KΩ, 1/2W | 3 |
| 10871 | R14 | res., 820Ω, 1W | 1 |
| 14002 | R15 | res., 10KΩ, 10W | 1 |
| 10904 | R16 | res., 10KΩ, 2W | 1 |
| 10906 | R17 | res., 33KΩ, 2W | 1 |
| 10038 | R20 | res., 3.3KΩ, 1W | 1 |
| 10819 | R21 | res., 15KΩ, 1W | 1 |
| 16004 | R22 | pot., 50KΩ | 1 |
| 10030 | R23 | res., 1MΩ, 1/2W | 1 |
| 10862 | R24 | res., 330Ω, 1W | 1 |
| 10751 | R25 | res., 1800Ω, 5W | 1 |
| 10016 | R26,27 | res., 10KΩ, 1/2W | 2 |
| 10902 | R28 | res., 1KΩ, 2W | 1 |
| 10042 | R29 | res., 330Ω, 1/2W | 1 |
| 61000 | S1 | switch SPST, toggle | 1 |
| 60016 | S2 | switch, 2P 4Pos., rotary | 1 |
| 62000 | S3 | switch, 2P 2 Pos., slide | 1 |
| 30002 | T1 | transformer, power | 1 |
| 54000 | TB1,2,3 | terminal strip, 1 post left. * | 3 |
| 54003 | TB4 | terminal strip, 2 post * | 1 |
| 90006 | V1 | tube, 6SJ7 | 1 |
| 90005 | V2,4 | tube, 6K6 | 2 |
| 90019 | V3 | tube, 6SN7 | 1 |
| 90009 | V5 | tube, 6X5 | 1 |

* riveted to chassis

# Model 377
# ASSEMBLY PRINT 1



Assembly Print 1 covers the entire mounting procedure. The step-by-step mounting table allows you to complete the mounting in a systematic manner. All the parts that are needed to mount a component are given by symbol number in the "Mounted With-(Remarks)" column. (Refer to the parts list for the descriptions corresponding to each symbol number). The method and location of mounting is shown in the drawing. For example, refer to step 1-1 in the mounting table and gather together all the parts called for. Locate the 3S6 lamp socket in the drawing. Notice the light broken line that passes through the lamp socket and traces a path to the mounting hole in the chassis. On this broken line you will find all the hardware called for in this step, strung out in the order that they take in the mounting. When you have mounted the lamp socket, place a check opposite 1-1 in the mounting table. The remaining steps are completed in the same manner.

To keep the drawing uncrowded, unnecessary repetition is avoided. For example, transformer T1 is fastened to the chassis by all four mounting brackets, whereas the method of mounting is shown at only one bracket. The drawings of Assembly Prints 2 and 3 may be referred to when a bottom view of the chassis would be helpful. Be sure that the plates of the main tuning condenser, C2, 3 , are fully meshed when the condenser is being handled or mounted. Otherwise the plates may be bent, thus affecting the calibration.

## MOUNTING

| Step# | Sym. | Description | Mounted With (Remarks) |
|---|---|---|---|
| 1-1 | H6 | lamp socket (3S6) | 1#H23, 1#H22, 1#H11 |
| 1-2 | R9 | 5K ohm pot | 1#H14 |
| 1-3 | H4 | shield | 3#H21, 3#H22 |
| 1-4 | H32 | 3/8 rubber grommet | 4 on chassis |
| 1-5 | T1 | power xfmr | 4#H23, 8#H21, 4#H22 |
| 1-6 | L1 | 5 hy. filter choke | 1#H11, 3#H21, 2#H22, 2#H23 |
| 1-7 | C4, 17 | dual 20 mf cond. | twist prongs |
| 1-8 | C5, 13 | dual 20 mf cond. | twist prongs |
| 1-9 | J1 | binding post | 1#H18, 1#H19, 1#H11, 1#H22 |
| 1-10 | J2 | binding post | 1#H18, 1#H11, 1#H22 |
| 1-11 | H5 | pilot lamp ass'y. | with associated hdwe. |
| 1-12 | S1 | power switch | 2#H31 |
| 1-13 | S3 | 2 pole, 2 pos. switch | 2# H8, 2#H9 |
| 1-14 | *R22 | 50K pot | 1#H14, 1#H13, 1#H12, 1#H17 |
| 1-15 | *S2 | 2 pole, 4 pos. switch | 1#H14, 1#H13, 1#H12 |
| 1-16 | C 2,3 | main tuning cond. | 2#H11, 3#H15, 3#H19, 2#H21, 3#H22 |
| 1-17 | H35 | bushing | 1#H12, 1#H14 |
| 1-18 | H20 | coupling | |
| 1-19 | H30 | 1/4 dia. shaft | |

*The mounting of R22 and S2 also serves the purpose of fastening the front panel to the chassis. See drawing.

Note: Be careful not to mar the front of the panel when fastening components to it.

## STEP#1-19: KNOB PLACEMENT

a) Place the bar knobs, H25, over the shafts of S2 and R22 and tighten the set screws.

b) Place the pointer-and-knob, H26, over the shaft, H30 (coupled to C2, 3), and tighten the set screw.

c) Turn all knobs counter-clockwise as far as they will go.

d) Now loosen all set screws.

e) Line up the bar knob on S2 with the marker for band A and tighten the set screw.

f) Line up the bar knob on R22 with the zero mark on the AMPL. dial and tighten the set screw.

g) Line up the hairline of the pointer-and-knob with the zero mark on the 0 to 100 reference scale of the frequency dial, and tighten the set screw.

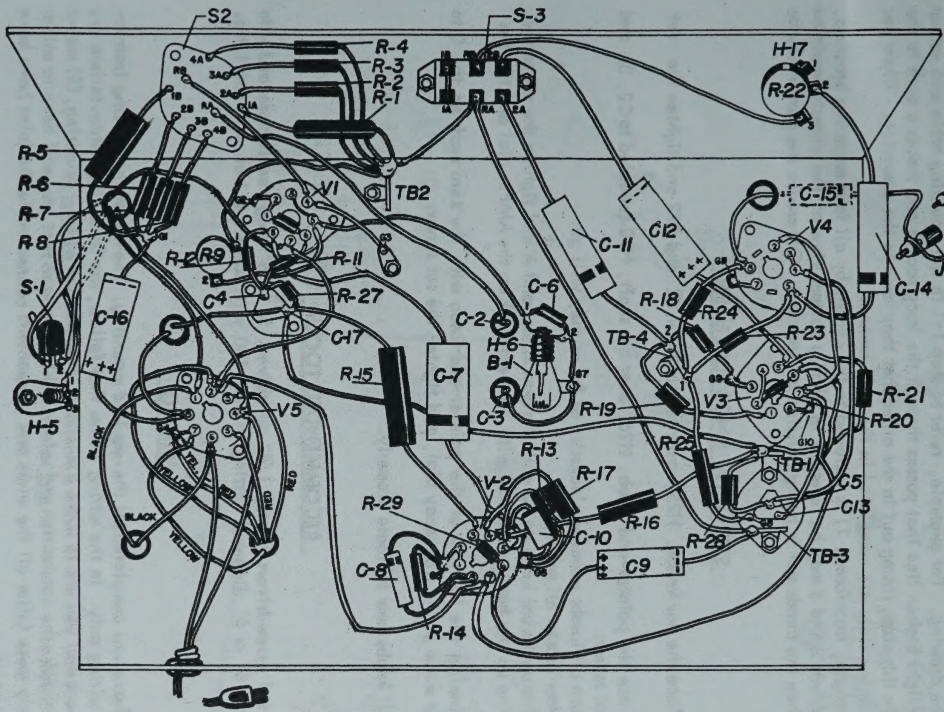
All knobs now indicate properly.

## RECOMMENDED TOOLS

Assorted screwdrivers (flat), 1/4" nut driver, 5" or 6" long needle nose and side cutting pliers, 5" or 6" diagonal cutting pliers, 100 watt soldering iron with small tip.

## WIRING

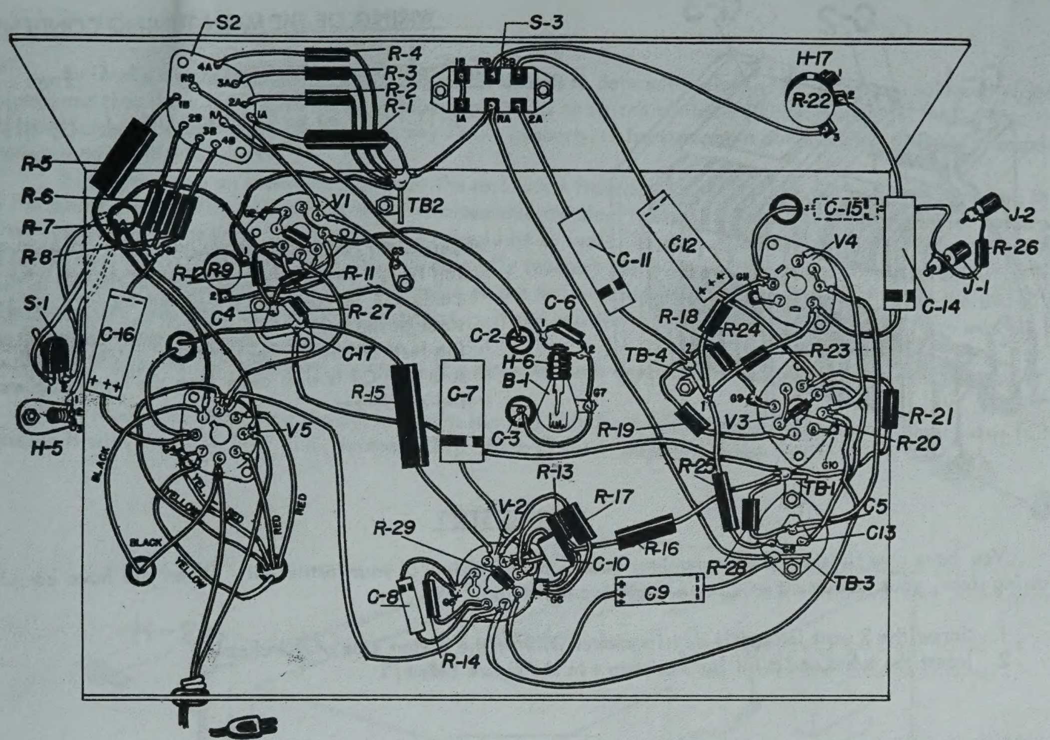
You have now completed all the required mounting. The rest of the working instructions are for wiring only. In the wiring tables that follow, the following abbreviations are used: (C) means that you are to make a mechanical connection without soldering, (S) means that you are to make the connection and solder. This is done so that you will have to solder each joint only once (after all the wires and components connected to the joint have been wired in).




# Model 377 ASSEMBLY PRINT 2

| ✓ | Step# | Sym. | Description | From | To |
|---|---|---|---|---|---|
| | 2-1 | T1 | yellow wire | | V5#7 (C) |
| | 2-2 | T1 | red-yellow wire | | G4 (C) |
| | 2-3 | H28 | bare wire | (S) V5#7 | G4 (S) |
| | 2-4 | T1 | red wire | | V5#5 (S) |
| | 2-5 | T1 | red wire | | V5#3 (S) |
| | 2-6 | T1 | yellow wire | | V5#2 (C) |
| | 2-7 | T1 | black wire | | V5#1 (C) |
| | 2-8 | T1 | black wire | | V5#6 (C) |
| | 2-9 | L1 | black wire | | C17 (C) |
| | 2-10 | L1 | black wire | | V5#8 (C) |
| | 2-11 | R8 | res., 18KΩ | (S) S2#4B | G1 (C) |
| | 2-12 | R7 | res., 180KΩ | (S) S2#3B | G1 (C) |
| | 2-13 | R6 | res., 1.8MΩ | (S) S2#2B | G1 (C) |
| | 2-14 | R5 | res., 18MΩ | (S) S2#1B | G1 (C) |
| | 2-15 | C16 | cap., 8 mfd | (S) V5#8* | G1 (S) |
| | 2-16 | R27 | res., 10KΩ, 1/2W | (C) C17 | C4 (C) |
| | 2-17 | H27 | hook-up wire | (C) V5#2 | V1#7 (C) |
| | 2-18 | H27 | hook-up wire | (S) V5#2 | V2#7 (C) |
| | 2-19 | H27 | hook-up wire | (S) V2#7 | V3#7 (C) |
| | 2-20 | H27 | hook-up wire | (S) V3#7 | V4#2 (S) |
| | 2-21 | H27 | hook-up wire | (C) C17 | TB1-1 (C) |
| | 2-22 | R15 | res., 10KΩ, 10W | (S) C17* | V2#3 (C) |
| | 2-23 | R12 | res., 68K | (C) C4 * | V1#8 (C) |
| | 2-24 | R11 | res., 100K, 1W | (S) C4 | V1#6 (C) |
| | 2-25 | R10 | res., 47K | (S) V1#6 | V1#1 (C) |
| | 2-26 | H28 | bare wire | (S) V1#1 | V1#2 (C) |
| | 2-27 | H28 | bare wire | (S) V1#2 | G2 (S) |
| | 2-28 | H27 | hook-up wire | (C) V1#5 | R9#2 (S) |
| | 2-29 | H28 | bare wire | (C) V1#5 | V1#3 (S) |
| | 2-30 | H27 | hook-up wire | (S) V1#5 | H6#1 (C) |
| | 2-31 | C6 | cap., 50 mmf | (S) H6#1 | H6#2 (C) |
| | 2-32 | R4 | res., 18KΩ | (S) S2#4A | TB2#1 (C) |
| | 2-33 | R3 | res., 180KΩ | (S) S2#3A | TB2#1 (C) |
| | 2-34 | R2 | res., 1.8MΩ | (S) S2#2A | TB2#1 (C) |
| | 2-35 | R1 | res., 18MΩ | (S) S2#1A | TB2#1 (C) |
| | 2-36 | H27 | hook-up wire | (S) R9#1 | TB2#1 (C) |
| | 2-37 | H27 | hook-up wire | (S) TB2#1 | S3#RA (C) |
| | 2-38 | H27 | hook-up wire | (C) V1#4 | S2#RB (S) |
| | 2-39 | H27 | hook-up wire | (S) V1#4 | G3 (S) |
| | 2-40 | H27 | hook-up wire | (S) S2#RA | C2 (S) |

*With spaghetti



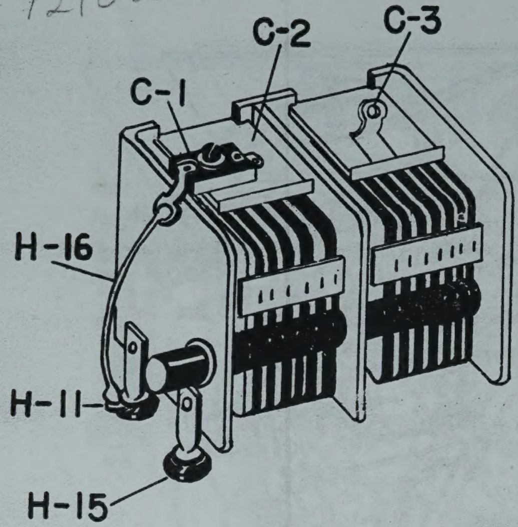

# Model 377 ASSEMBLY PRINT 2

| ✓ | Step# | Sym. | Description | From | To |
|---|---|---|---|---|---|
| | 2-41 | R17 | res.,33K,2W | (C) V2#4 | G6 (C) |
| | 2-42 | C10 | cap., 250 mmf | (C) V2#4 | G6 (C) |
| | 2-43 | R16 | res.,10K, 2W | (S) V2#4 * | *TB1-1 (C) |
| | 2-44 | R13 | res.,470K | (C) V2#5 | G6 (S) |
| | 2-45 | C7 | cap., .5 mf | (S) V2#5* | *V1#8 (S) |
| | 2-46 | R29 | res., 330Ω | (S) V2#3 | V2#6 (C) |
| | 2-47 | R14 | res., 820Ω | (C) V2#8 | G5 (C) |
| | 2-48 | C8 | cap., .003 mf | (S) V2#8 | G5 (C) |
| | 2-49 | H28 | bare wire | (S) V2#1 | V2#2 (C) |
| | 2-50 | H28 | bare wire | (S) V2#2 | G5 (S) |
| | 2-51 | C9 | cap., 8mf | (S) V2#6* | *TB3#1 (C) |
| | 2-52 | H27 | hook-up wire | (S) H6#2 | G7 (C) |
| | 2-53 | H27 | hook-up wire | (S) G7 | C3 (S) |
| | 2-54 | H27 | hook-up wire | (S) TB3#1 | S3#RA(S) |
| | 2-55 | H28 | bare wire | (S) S3#1B | S3#1A(S) |
| | 2-56 | R28 | res., 1K, 2W | (S) TB1#1 | C5 (C) |
| | 2-57 | R25 | res., 1800Ω,5W | (S) G8 * | TB4#1 (C) |
| | 2-58 | R23 | res., 1MΩ | (C) TB4#1 | V4#5 (C) |
| | 2-59 | R24 | res., 330Ω, 1W | (S) TB4#1** | V4#8 (C) |
| | 2-60 | R18 | res., 470KΩ | (C) TB4#2 | G9 (C) |

*With spaghetti

| ✓ | Step# | Sym. | Description | From | To |
|---|---|---|---|---|---|
| | 2-61 | H28 | bare wire | (S) V3#3 | G9 (S) |
| | 2-62 | R19 | res., 470KΩ | (C) TB4#2 | V3#1 (S) |
| | 2-62 | C11 | cap., .25mf | (S) TB4#2 | *S3#2A(S) |
| | 2-63 | H27 | hook-up wire | (S) C13 | V3#6 (C) |
| | 2-64 | R20 | res., 3.3KΩ | (S) V3#6 | V3#2 (C) |
| | 2-65 | H28 | bare wire | (S) V3#2 | V3#4 (S) |
| | 2-66 | H27 | hook-up wire | (S) C5 | V4#4 (C) |
| | 2-67 | H28 | bare wire | (S) V4#4 | V4#3 (S) |
| | 2-68 | H28 | bare wire | (S) V3#8 | G10 (S) |
| | 2-69 | C12 | cap., 8mf | (C) V3#5* | *S3#2B (S) |
| | 2-70 | R21 | res.,15KΩ | (S) V3#5* | TB1#1 (S) |
| | 2-71 | H28 | bare wire | (S) V4#7 | G11 (S) |
| | 2-72 | C14 | cap., .25mf | (S) V4#5* | *R22#2 (S) |
| | 2-73 | H17 | ground lug | under R22 | R22#1 (S) |
| | 2-74 | H27 | hook-up wire | (S) R22#3 | S3#RB (S) |
| | 2-75 | H27 | hook-up wire | (S) V5#1 | S1#1 (S) |
| | 2-76 | H27 | hook-up wire | (C) V5#4 | S1#2 (S) |
| | 2-76 | H27 | hook-up wire | (S) V1#7 | H5#1 (S) |
| | 2-77 | H28 | bare wire | (S) H5#2 | H5#3 (S) |
| | 2-78 | H29 | line cord ** | | V5#4 (S) |
| | 2-79 | H29 | line cord ** | | V5#6 (S) |
| | 2-80 | C15 | cap., 20mf | (S) V4#8* | *J1 (C) |
| | 2-81 | R26 | res., 10K | (S) J1 | J2 (S) |

12102




## WIRING OF THE MAIN TUNING CONDENSER

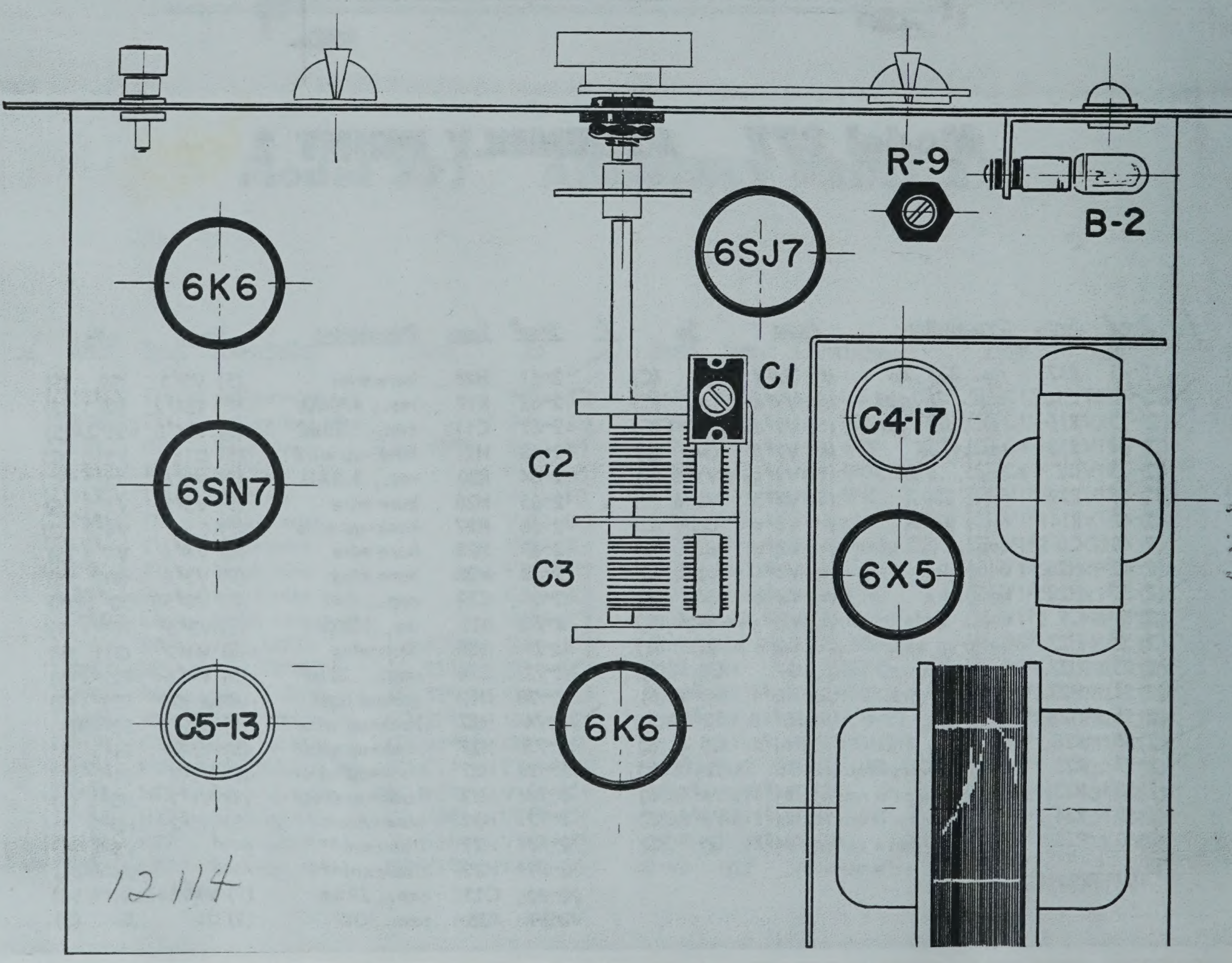
| √ | Step# | Sym. | Description | From | To |
|---|---|---|---|---|---|
| | 3-1 | C1 | ** 80 mmf trimmer cond. | (S) H11 | (S) C2 |

**Solder 2 1/2" length of heavy bare wire (H16) to ground lug H11. Be sure that H11 is not shorted to the chassis. Place C1 in position so that the heavy bare wire passes through the terminal lug at one end and the other terminal lug rests on the contact of C2. Solder at both ends. Be sure that C1 is well away from the frame of the main tuning condenser.

## FINAL STEPS

You have now finished the mechanical assembly and wiring of your instrument. When you have completed the following steps, your instrument will be in operating condition.

1. Screw the 3 watt lamp (B1) into its socket (H6) on the bottom side of the chassis.
2. Insert the tubes and pilot light as shown in the figure below.




12114

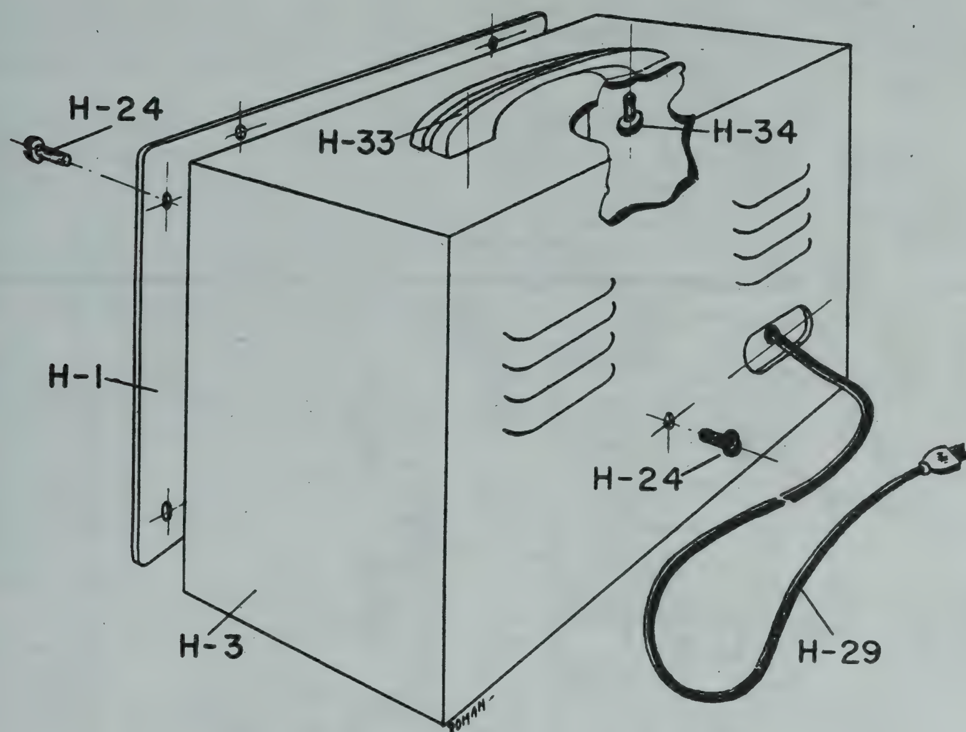
3. Make a careful examination of the entire chassis to determine whether all joints are soldered properly (no rosin joints), and that there is no rosin between tube socket lugs or switch contacts to cause leakage. Make sure that there are no loose lumps of solder in the chassis that may result in shorts. Also straighten out the wiring and the components so that there are no accidental shorts.

4. If you have an ohmmeter, measure the resistance from pin 8 of V5 to ground (before connecting the instrument to the power line). You will notice that the ohmmeter reading increases steadily as the ohmmeter battery charges the filter condensers of the unit. The final reading should be at least 35,000 ohms. If the reading is less than 100,000 ohms, DO NOT TURN THE INSTRUMENT ON, but carefully recheck the wiring of the power supply circuit.

5. Measure the resistance from the frame of the main tuning condenser to ground. When the BAND switch is set at band A, this resistance should be 18 megohms. If the resistance is much lower, check the fibre washers that insulate the condenser frame from the chassis.

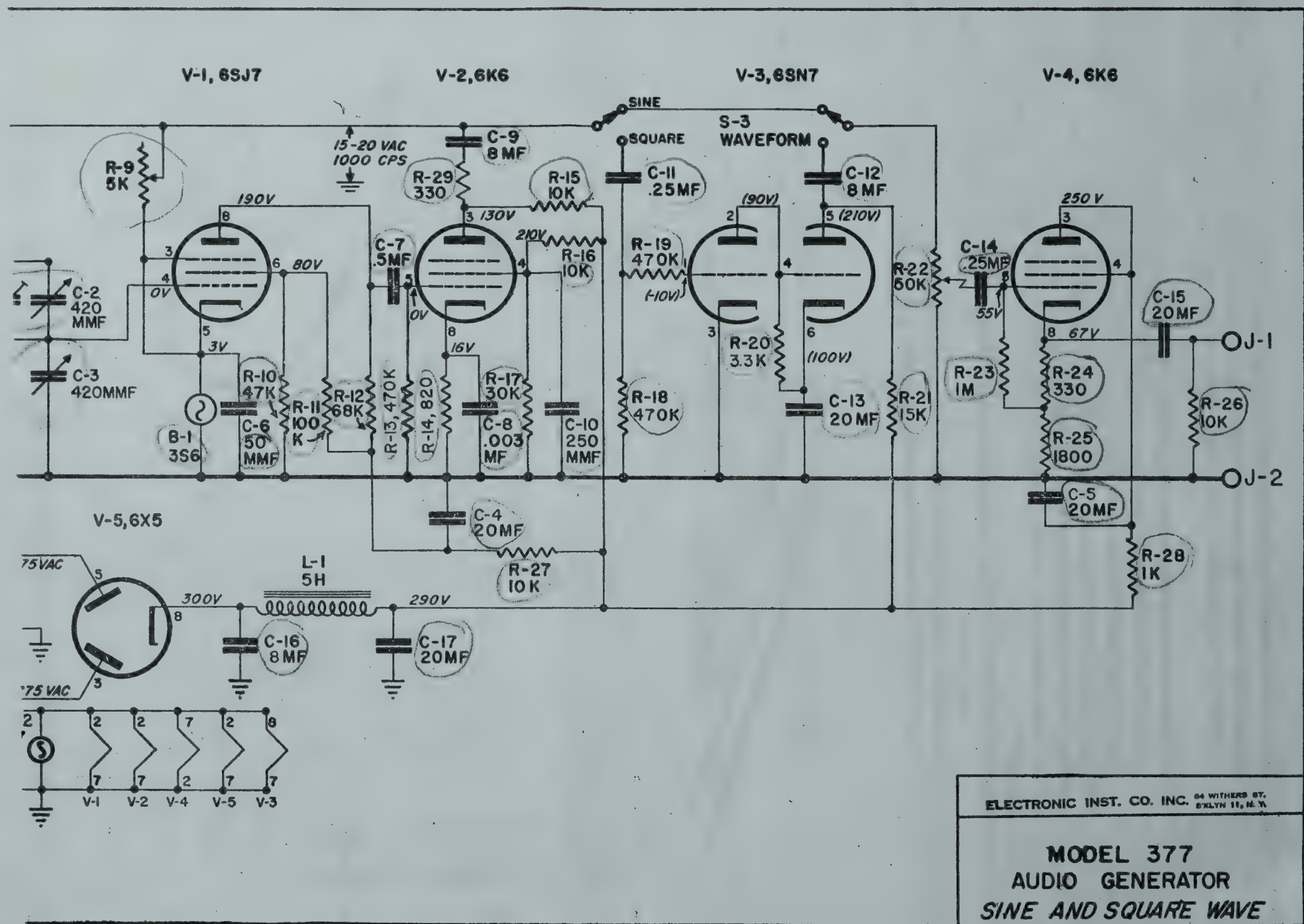
6. Calibrate the instrument by one of the three methods described in the MAINTENANCE section of the Instruction Book.

7. Mount the handle on the cabinet with the two #10-24 X 1/4" screws (H34). Insert the chassis in the cabinet, securing it with the #6 X 1/4" P.K. screws (H24). Both of these steps are shown in the figure below.




If the instrument fails to operate properly, make certain that the wiring and the components in the circuit are correct. Almost all troubles reported to us in the past, have had improper wiring as their cause. If the wiring is correct, test for continuity and check individual components for breakdown. If you have a high input impedance VTVM, such as the EICO Model 214 or 221, check the voltages shown on the schematic diagram. The voltages shown in parenthesis are measured with the WAVEFORM selector switch set at SQUARE. The other voltages are measured with the WAVEFORM selector switch set at SINE. All voltages may vary from the values shown by as much as 20%. Failure to obtain the proper voltages at any point should indicate where to look for the trouble.

If you are still having difficulty, write to our engineering department (Electronic Instrument Co., Inc., 33-00 Northern Blvd., L.I.C. 1, New York) listing all indications which might be helpful. If desired, you may return the instrument to our factory, where it will be placed in operating condition and calibrated for $5.00 plus the cost of parts replaced due to their being damaged in the construction of the instrument. Pack the unit very carefully; in the original shipping carton, if possible. Send it to the above address, prepaid Railway Express. The instrument will be returned as soon as possible, express collect.




ELECTRONIC INST. CO. INC. 84 WITHERS ST. B'KLYN 11, N. Y.

MODEL 377
AUDIO GENERATOR
*SINE AND SQUARE WAVE*

# AUDIO SINE AND SQUARE WAVE GENERATOR

EICO

## LOCAL AUTHORIZED SERVICE STATIONS FOR OUT-OF-WARRANTY REPAIRS

For the convenience of our customers who may prefer to have their units serviced locally, the following repair stations have been franchised and are equipped to service all EICO units:

Instrument Service Co.
8907 S. Vermont Avenue
Los Angeles 44, California

Walter Ament's, Inc.
10 East Colorado Avenue
Colorado Springs, Colorado

Industrial Instrument Works
3328 Magazine Street
New Orleans 15, Louisiana

Chase Television Service, Inc.
16311 Grand River
Detroit 27, Michigan

Scherrer Instruments
5449 Delmar Boulevard
St. Louis 12, Missouri

B & S Electronics, Inc.
6338 W. Roosevelt Road
Oak Park
Chicago, Illinois

Andersen
3230 E. 42nd
Minneapolis, Minnesota

Southern Authorized Factory Service
62 N. W. 27th Avenue
Miami 35, Florida

Syracuse Instrument Labs.
2904 South Avenue
Syracuse 7, New York

Speed Instrument Co.
2718 Rothgeb Drive also P. O. Box 9028
Raleigh, North Carolina

Electronic Instrument Service Co.
10023 Madison Avenue
Cleveland 2, Ohio

Far Hills Service Center
45 West Whipp Road
Dayton 59, Ohio

Mundine Radio & Instrument Service
724 1/2 North St. Mary's St.
San Antonio 5, Texas

American Technical and Services
4961 Bethesda Avenue
Bethesda, Maryland

Dave's Radio & Television
4528 Monroe Street
Toledo 13, Ohio

B & M Electronic Service
2215 S. Shepherd Dr.
Houston 19, Texas

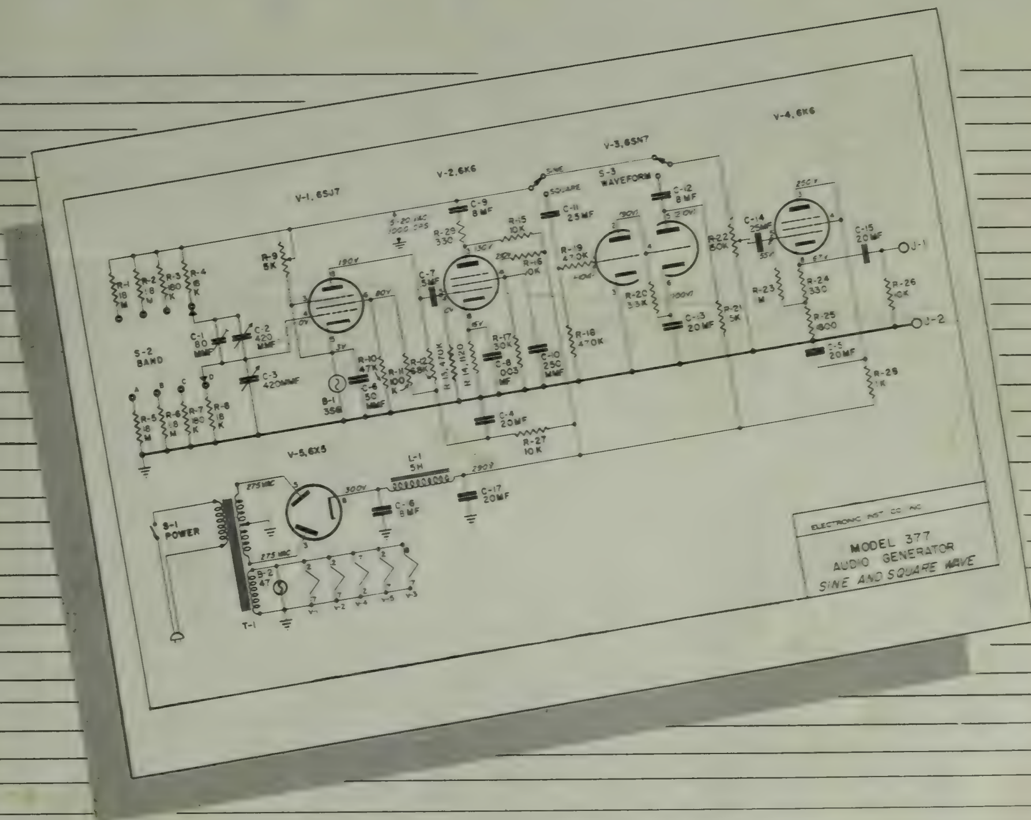
These repair stations are authorized to perform out-of-warranty chargeable repair work in accordance with factory standards. In-warranty repairs should be returned to the factory in accordance with the instructions printed in the accompanying manual.

# CONSTRUCTION MANUAL

## Model 377

MODEL 377-1

## AUDIO SINE AND SQUARE WAVE GENERATOR

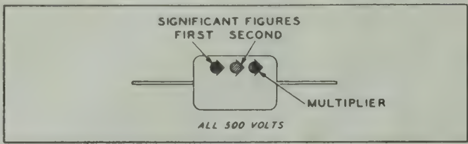



ELECTRONIC INSTRUMENT CO., Inc.

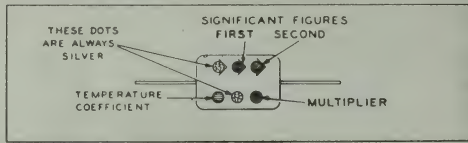
Reg. U. S. Pat. Off.

# CAPACITOR COLOR CODES

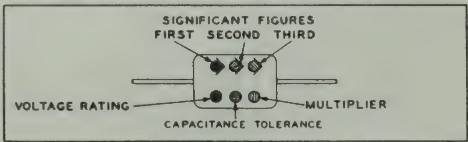
*RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS*



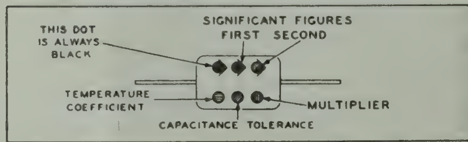

*JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS*



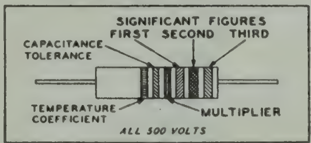

*RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS*




*JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS*

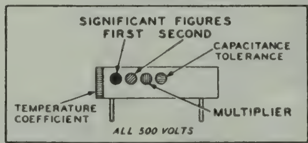



*RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS*

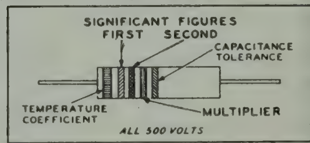



*JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS*

*RADIAL TYPE NON-INSULATED*




*AXIAL TYPE INSULATED*



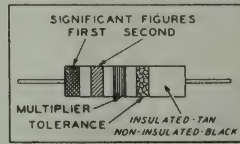

*RMA: RADIO MANUFACTURERS ASSOCIATION*
*JAN: JOINT ARMY-NAVY*

| RESISTORS | | | | CAPACITORS | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | MULTIPLIER | | | | |
| TOLERANCE | MULTIPLIER | SIGNIFICANT FIGURE | COLOR | RMA MICA AND CERAMIC-DIELECTRIC | JAN MICA AND PAPER-DIELECTRIC | JAN CERAMIC DIELECTRIC | VOLTAGE RATING | TEMPERATURE COEFFICIENT |
| | 1 | 0 | BLACK | 1 | 1 | 1 | | A |
| | 10 | 1 | BROWN | 10 | 10 | 10 | 100 | B |
| | 100 | 2 | RED | 100 | 100 | 100 | 200 | C |
| | 1,000 | 3 | ORANGE | 1,000 | 1000 | 1000 | 300 | D |
| | 10,000 | 4 | YELLOW | 10,000 | | | 400 | E |
| | 100,000 | 5 | GREEN | 100,000 | | | 500 | F |
| | 1,000,000 | 6 | BLUE | 1,000,000 | | | 600 | G |
| | 10,000,000 | 7 | VIOLET | 10,000,000 | | | 700 | |
| | 100,000,000 | 8 | GRAY | 100,000,000 | | 0.01 | 800 | |
| | 1,000,000,000 | 9 | WHITE | 1,000,000,000 | | 0.1 | 900 | |
| 5 | 0.1 | | GOLD | 0.1 | 0.1 | | 1000 | |
| 10 | 0.01 | | SILVER | 0.01 | 0.01 | | 2000 | |
| 20 | | | NO COLOR | | | | 500 | |

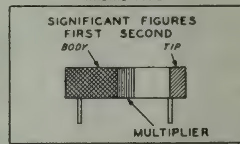
# RESISTOR COLOR CODES

*RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS*

*AXIAL TYPE*

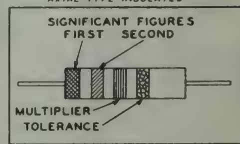



*RADIAL TYPE*

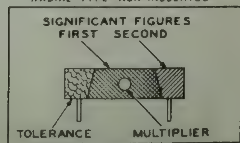



*JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS*

*AXIAL TYPE INSULATED*




*RADIAL TYPE NON-INSULATED*



## GENERAL INSTRUCTIONS

1) The Model 377 Audio Generator is constructed very easily with the aid of fully detailed perspective drawings and step-by-step instructions. Before starting the actual construction, it is advisable to study the schematic and pictorial wiring diagrams until all of the steps are clear in your mind. Do not rush the construction, as careful work will result in a properly constructed instrument in the shortest time. In addition, it is suggested that you run all leads exactly as shown on the pictorial wiring diagrams, as this will make the wiring an easier job and insure proper operation of the instrument.

2) USE A GOOD GRADE OF ROSIN CORE SOLDER ONLY. UNDER NO CIRCUMSTANCES USE ACID CORE SOLDER OR ACID FLUX inasmuch as the acid flux can cause serious corrosion. Before soldering, make certain there is a good mechanical connection. The solder must flow before you remove the soldering iron as this will prevent rosin joints which are poor electrical conductors. If you are soldering close to a part, hold the ends of a pair of longnose pliers between the part and the solder joint. The pliers will conduct the heat away and prevent the component from being unduly overheated.

3) Carefully unwrap all the parts and check them in the space provided on the parts list. Note: In order to maintain the supply of kits and insure prompt delivery, we are forced to buy the same component from several sources (standard manufacturers' parts are interchangeable). You may find that the value of a component will vary within the allowable circuit tolerance. This means a resistance of 470,000 ohms may be substituted for, or may measure 510,000 ohms, etc. Any part supplied will work as well as the part for which it was substituted. No substitutions will be made on precision components.

## CONSTRUCTION PROCEDURE

For your convenience, the construction of the instrument has been broken down into a logical series of Assembly Prints. Each Assembly Print consists of a detailed drawing and a table of step-by-step instruction so that no step can be overlooked. Space has been provided on the tables to check off each step as it is completed. Follow the order of the Assembly Prints to finish the mechanical assembly and the wiring quickly and easily.

## PARTS LIST FOR MODEL 377

| Stock# | Sym. | Description | Am't. |
|---|---|---|---|
| 92001 | B1 | lamp, 3S6 - 3W | 1 |
| 92000 | B2 | lamp, #47 | 1 |
| 29507 | C1 | cap., trimmer, 5-80 mmf | 1 |
| 29005 | C2,3 | cap., tuning, 2 X 420 mmf | 1 |
| 24001 | C4,17 | cap., elec. 2 X 20 mf - 450 V | 1 |
| 24001 | C5,13 | cap., elec. 2 X 20 mf - 450 V | 1 |
| 22000 | C6 | cap., ceramic, 50 mmf | 1 |
| 20005 | C7 | cap., paper, .5 mf | 1 |
| 20007 | C8 | cap., .003 mf paper, | 1 |
| 23002 | C9,12 | Cap., elec. 8 mf - 350 V | 2 |
| 21001 | C10 | cap., 270 mmf, mica | 1 |
| 20004 | C11,14 | cap., paper, .25 mf | 2 |
| 23004 | C15 | cap., elec. 20 mf - 150 V | 1 |
| 23005 | C16 | cap., elec. 8 mf - 450 V | 1 |
| 80040 | H1 | panel | 1 |
| 81061 | H2 | chassis | 1 |
| 88002 | H3 | cabinet | 1 |
| 81013 | H4 | shield | 1 |
| 97700 | H5 | pilot light assembly | 1 |
| 97705 | H6 | lamp socket (3S6) | 1 |
| 97003 | H7 | octal socket * | 5 |
| 41016 | H8 | screw, #4-40x 1/4 | 2 |
| 40007 | H9 | nut, hex #4-40 | 2 |
| 59500 | H10 | mounting plate * | 2 |
| 43000 | H11 | ground lug | 6 |
| 42000 | H12 | lock washer, 3/8 | 4 |
| 42001 | H13 | flat washer, 3/8 | 2 |
| 40001 | H14 | nut, 3/8 hex | 4 |
| 42006 | H15 | washer, 1/4 fibre shoulder | 3 |
| 58500 | H16 | wire, heavy bare | length |

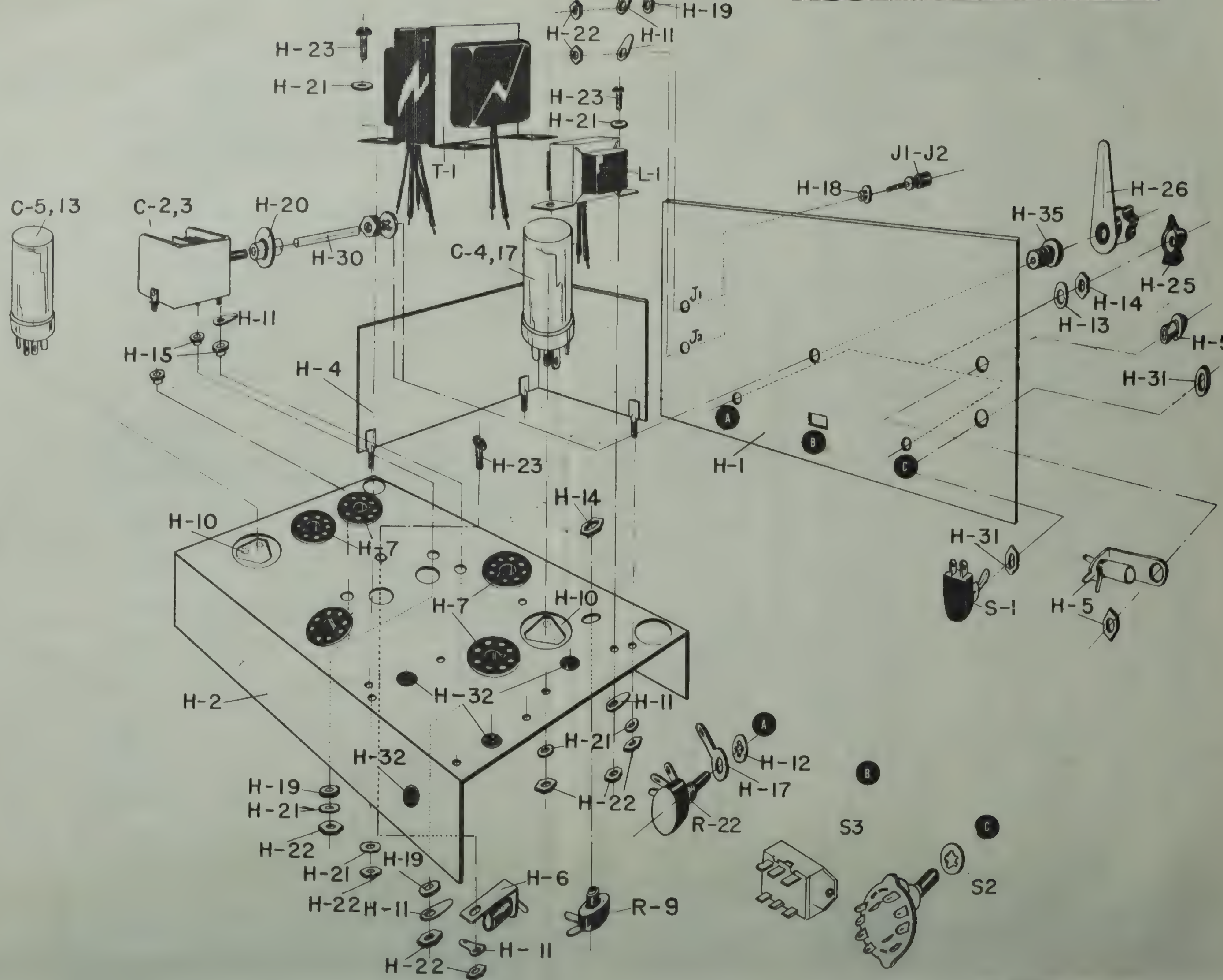
* riveted to chassis

| Stock# | Sym. | Description | Am't. |
|---|---|---|---|
| 43001 | H17 | lug, 3/8 ground | 1 |
| 42006 | H18 | washer, 1/4 fibre shoulder | 2 |
| 42003 | H19 | washer, 1/4 fibre flat | 4 |
| 83000 | H20 | insulated coupling | 1 |
| 42002 | H21 | washer, #6 lock | 17 |
| 40000 | H22 | nut, #6 hex | 15 |
| 41000 | H23 | screw, #6 X 1/4 | 7 |
| 41002 | H24 | screw, #6 P.K. | 9 |
| 53000 | H25 | knob, bar | 2 |
| 53500 | H26 | knob, w/ plastic pointer | 1 |
| 58000 | H27 | wire, hook-up | length |
| 58501 | H28 | wire, bare | length |
| 57000 | H29 | line cord | 1 |
| 82000 | H30 | shaft, 1/4" D | 1 |
| 40003 | H31 | nut, 15/32" D hex & round | 2 |
| 46000 | H32 | grommet, 3/8 | 4 |
| 87000 | H33 | handle | 1 |
| 41001 | H34 | screw, #10-24 X 1/4 | 2 |
| 85000 | H35 | bushing | 1 |
| 58300 | H36 | spaghetti | length |
| 52000 | J1,2 | binding post | 2 |
| 34000 | L1 | choke, 5 Hy. | 1 |
| 11702 | R1,5 | res., 18MΩ, 1% | 2 |
| 11053 | R2,6 | res., 1.8MΩ, 1% | 2 |
| 11054 | R3,7 | res., 180KΩ, 1% | 2 |
| 11055 | R4,8 | res., 18KΩ, 1% | 2 |
| 18009 | R9 | pot., 5KΩ ,min. | 1 |
| 10022 | R10 | res., 47KΩ, 1/2W | 1 |

| Stock# | Sym. | Description | Am't. |
|---|---|---|---|
| 10811 | R11 | res., 100KΩ, 1W | 1 |
| 10023 | R12 | res., 68KΩ, 1/2W | 1 |
| 10028 | R13,18 19 | res., 470KΩ, 1/2W | 3 |
| 10871 | R14 | res., 820Ω, 1W | 1 |
| 14002 | R15 | res., 10KΩ, 10W | 1 |
| 10904 | R16 | res., 10KΩ, 2W | 1 |
| 10906 | R17 | res., 33KΩ, 2W | 1 |
| 10038 | R20 | res., 3.3KΩ, 1W | 1 |
| 10819 | R21 | res., 15KΩ, 1W | 1 |
| 16004 | R22 | pot., 50KΩ | 1 |
| 10030 | R23 | res., 1MΩ, 1/2W | 1 |
| 10862 | R24 | res., 330Ω, 1W | 1 |
| 14502 ~~10751~~ | R25 | res., 1800Ω, 5W | 1 |
| 10016 | R26,27 | res., 10KΩ, 1/2W | 2 |
| 10902 | R28 | res., 1KΩ, 2W | 1 |
| 10042 | R29 | res., 330Ω, 1/2W | 1 |
| 61000 | S1 | switch SPST, toggle | 1 |
| 60016 | S2 | switch, 2P 4Pos., rotary | 1 |
| 62000 | S3 | switch, 2P 2 Pos., slide | 1 |
| 30002 | T1 | transformer, power | 1 |
| 54000 | TB1,2,3 | terminal strip, 1 post left. * | 3 |
| 54003 | TB4 | terminal strip, 2 post * | 1 |
| 90006 | V1 | tube, 6SJ7 | 1 |
| 90005 | V2,4 | tube, 6K6 | 2 |
| 90019 | V3 | tube, 6SN7 | 1 |
| 90009 | V5 | tube, 6X5 | 1 |

# Model 377

# ASSEMBLY PRINT 1



Assembly Print 1 covers the entire mounting procedure. The step-by-step mounting table allows you to complete the mounting in a systematic manner. All the parts that are needed to mount a component are given by symbol number in the "Mounted With-(Remarks)" column. (Refer to the parts list for the descriptions corresponding to each symbol number). The method and location of mounting is shown in the drawing. For example, refer to step 1-1 in the mounting table and gather together all the parts called for. Locate the 3S6 lamp socket in the drawing. Notice the light broken line that passes through the lamp socket and traces a path to the mounting hole in the chassis. On this broken line you will find all the hardware called for in this step, strung out in the order that they take in the mounting. When you have mounted the lamp socket, place a check opposite 1-1 in the mounting table. The remaining steps are completed in the same manner.

To keep the drawing uncrowded, unnecessary repetition is avoided. For example, transformer T1 is fastened to the chassis by all four mounting brackets, whereas the method of mounting is shown at only one bracket. The drawings of Assembly Prints 2 and 3 may be referred to when a bottom view of the chassis would be helpful. Be sure that the plates of the main tuning condenser, C2, 3 , are fully meshed when the condenser is being handled or mounted. Otherwise the plates may be bent, thus affecting the calibration.

## MOUNTING

| √ | Step# | Sym. | Description | Mounted With (Remarks) |
|---|---|---|---|---|
| | 1-1 | H6 | lamp socket (3S6) | 1#H23, 1#H22, 1#H11 |
| | 1-2 | R9 | 5K ohm pot | 1#H14 |
| | 1-3 | H4 | shield | 3#H21, 3#H22 |
| | 1-4 | H32 | 3/8 rubber grommet | 4 on chassis |
| | 1-5 | T1 | power xfmr | 4#H23, 8#H21, 4#H22 |
| | 1-6 | L1 | 5 hy. filter choke | 1#H11, 3#H21, 2#H22, 2#H23 |
| | 1-7 | C4, 17 | dual 20 mf cond. | twist prongs |
| | 1-8 | C5, 13 | dual 20 mf cond. | twist prongs |
| | 1-9 | J1 | binding post | 1#H18, 1#H19, 1#H11, 1#H22 |
| | 1-10 | J2 | binding post | 1#H18, 1#H11, 1#H22 |
| | 1-11 | H5 | pilot lamp ass'y. | with associated hdwe. |
| | 1-12 | S1 | power switch | 2#H31 |
| | 1-13 | S3 | 2 pole, 2 pos. switch | 2# H8, 2#H9 |
| | 1-14 | *R22 | 50K pot | 1#H14, 1#H13, 1#H12, 1#H17 |
| | 1-15 | *S2 | 2 pole, 4 pos. switch | 1#H14, 1#H13, 1#H12 |
| | 1-16 | C 2,3 | main tuning cond. | 2#H11, 3#H15, 3#H19, 2#H21, 3#H22 |
| | 1-17 | H35 | bushing | 1#H12, 1#H14 |
| | 1-18 | H20 | coupling | |
| | 1-19 | H30 | 1/4 dia. shaft | |

*The mounting of R22 and S2 also serves the purpose of fastening the front panel to the chassis. See drawing.

Note: Be careful not to mar the front of the panel when fastening components to it.

## STEP#1-19: KNOB PLACEMENT

a) Place the bar knobs, H25, over the shafts of S2 and R22 and tighten the set screws.

b) Place the pointer-and-knob, H26, over the shaft, H30 (coupled to C2, 3), and tighten the set screw.

c) Turn all knobs counter-clockwise as far as they will go.

d) Now loosen all set screws.

e) Line up the bar knob on S2 with the marker for band A and tighten the set screw.

f) Line up the bar knob on R22 with the zero mark on the AMPL. dial and tighten the set screw.

g) Line up the hairline of the pointer-and-knob with the zero mark on the 0 to 100 reference scale of the frequency dial, and tighten the set screw.

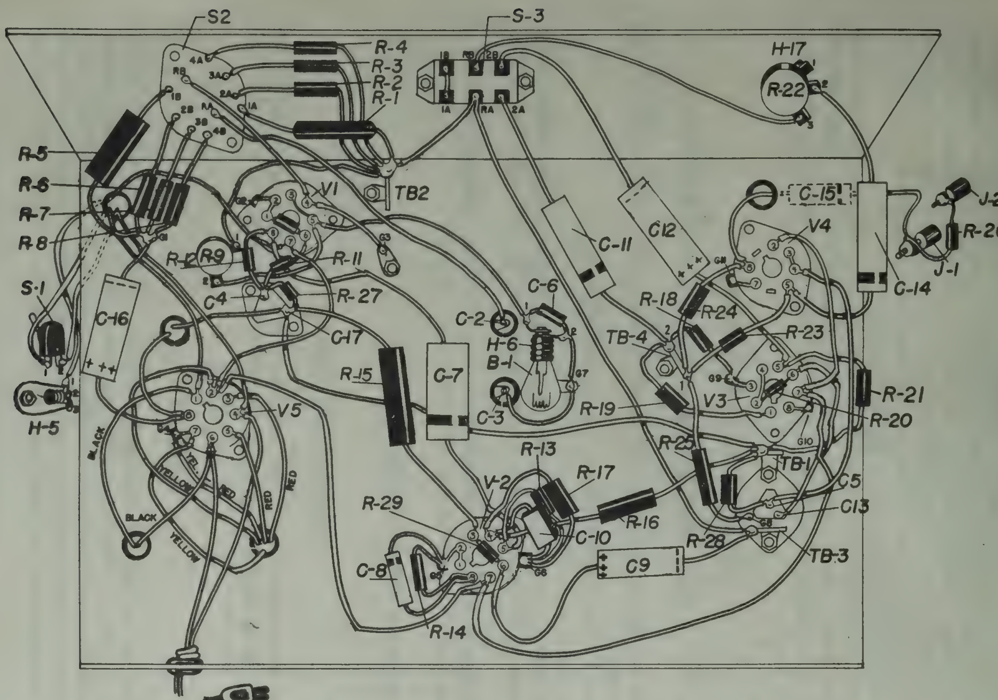
All knobs now indicate properly.

## RECOMMENDED TOOLS

Assorted screwdrivers (flat), 1/4" nut driver, 5" or 6" long needle nose and side cutting pliers, 5" or 6" diagonal cutting pliers, 100 watt soldering iron with small tip.

## WIRING

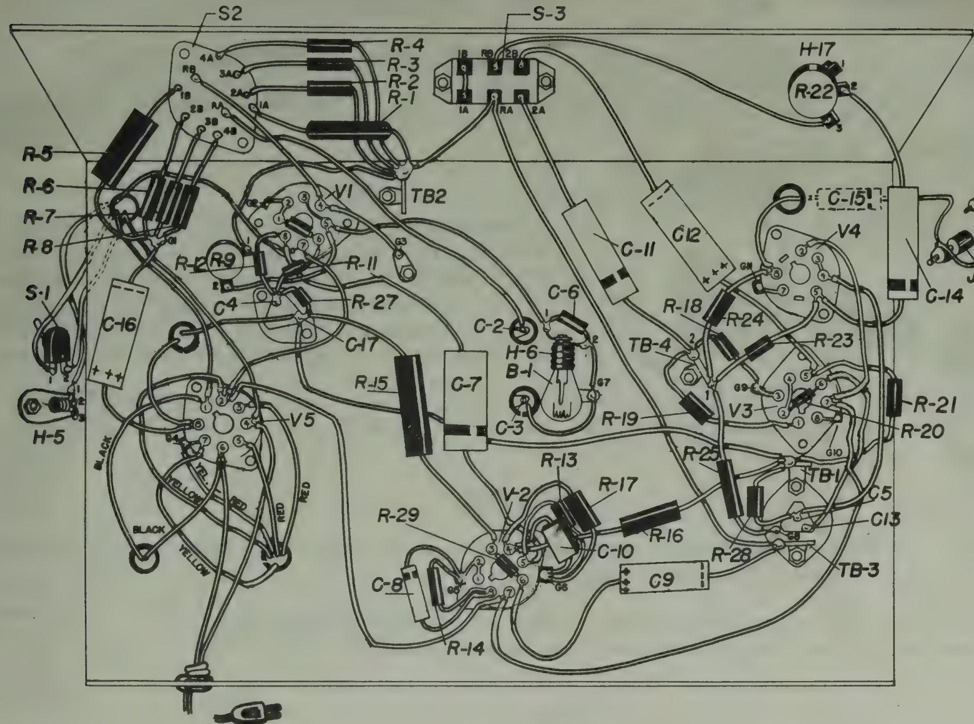
You have now completed all the required mounting. The rest of the working instructions are for wiring only. In the wiring tables that follow, the following abbreviations are used: (C) means that you are to make a mechanical connection without soldering, (S) means that you are to make the connection and solder. This is done so that you will have to solder each joint only once (after all the wires and components connected to the joint have been wired in).




# Model 377 ASSEMBLY PRINT 2

| ✓ | Step# | Sym. | Description | From | To |
|---|---|---|---|---|---|
| ✓ | 2-1 | T1 | yellow wire | | V5#7 (C) |
| ✓ | 2-2 | T1 | red-yellow wire | | G4 (C) |
| ✓ | 2-3 | H28 | bare wire | (S) V5#7 | G4 (S) |
| ✓ | 2-4 | T1 | red wire | | V5#5 (S) |
| ✓ | 2-5 | T1 | ~~red wire~~ | | V5#3 (S) |
| ✓ | 2-6 | T1 | yellow wire | | V5#2 (C) |
| ✓ | 2-7 | T1 | black wire | | V5#1 (C) |
| ✓ | 2-8 | T1 | black wire | | V5#6 (C) |
| ✓ | 2-9 | L1 | black wire | | C17 (C) |
| ✓ | 2-10 | L1 | black wire | | V5#8 (C) |
| ✓ | 2-11 | R8 | res., 18KΩ | (S) S2#4B | G1 (C) |
| ✓ | 2-12 | R7 | res., 180KΩ | (S) S2#3B | G1 (C) |
| ✓ | 2-13 | R6 | res., 1.8MΩ | (S) S2#2B | G1 (C) |
| ✓ | 2-14 | R5 | res., 18MΩ | (S) S2#1B | G1 (C) |
| ✓ | 2-15 | C16 | cap., 8 mfd | (S) V5#8* | G1 (S) |
| ✓ | 2-16 | R27 | res., 10KΩ, 1/2W | (C) C17 | C4 (C) |
| ✓ | 2-17 | H27 | hook-up wire | (C) V5#2 | V1#7 (C) |
| ✓ | 2-18 | H27 | hook-up wire | (S) V5#2 | V2#7 (C) |
| ✓ | 2-19 | H27 | hook-up wire | (S) V2#7 | V3#7 (C) |
| ✓ | 2-20 | H27 | hook-up wire | (S) V3#7 | V4#2 (S) |
| ✓ | 2-21 | H27 | hook-up wire | (C) C17 | TB1-1 (C) |
| ✓ | 2-22 | R15 | res., 10KΩ, 10W | (S) C17* | V2#3 (C) |
| ✓ | 2-23 | R12 | res., 68K | (C) C4 * | V1#8 (C) |
| ✓ | 2-24 | R11 | res., 100K, 1W | (S) C4 | V1#6 (C) |
| ✓ | 2-25 | R10 | res., 47K | (S) V1#6 | V1#1 (C) |
| ✓ | 2-26 | H28 | bare wire | (S) V1#1 | V1#2 (C) |
| ✓ | 2-27 | H28 | bare wire | (S) V1#2 | G2 (S) |
| ✓ | 2-28 | H27 | hook-up wire | (C) V1#5 | R9#2 (S) |
| ✓ | 2-29 | H28 | bare wire | (C) V1#5 | V1#3 (S) |
| ✓ | 2-30 | H27 | hook-up wire | (S) V1#5 | H6#1 (C) |
| ✓ | 2-31 | C6 | cap., 50 mmf | (S) H6#1 | H6#2 (C) |
| ✓ | 2-32 | R4 | res., 18KΩ | (S) S2#4A | TB2#1 (C) |
| ✓ | 2-33 | R3 | res., 180KΩ | (S) S2#3A | TB2#1 (C) |
| ✓ | 2-34 | R2 | res., 1.8MΩ | (S) S2#2A | TB2#1 (C) |
| ✓ | 2-35 | R1 | res., 18MΩ | (S) S2#1A | TB2#1 (C) |
| ✓ | 2-36 | H27 | hook-up wire | (S) R9#1 | TB2#1 (C) |
| ✓ | 2-37 | H27 | hook-up wire | (S) TB2#1 | S3#RA (C) |
| ✓ | 2-38 | H27 | hook-up wire | (C) V1#4 | S2#RB (S) |
| ✓ | 2-39 | H27 | hook-up wire | (S) V1#4 | G3 (S) |
| ✓ | 2-40 | H27 | hook-up wire | (S) S2#RA | C2 (S) |

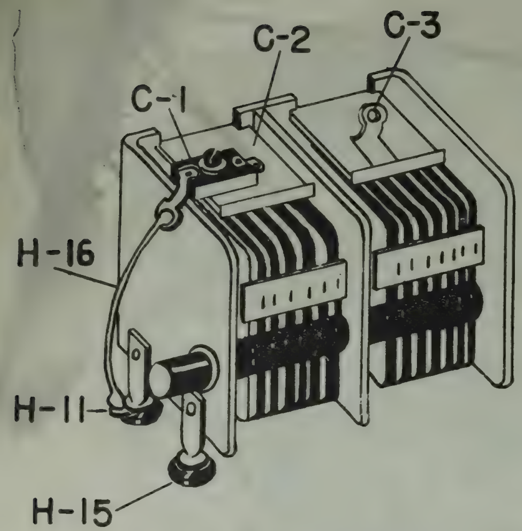
*With spaghetti




# Model 377 ASSEMBLY PRINT 2

| ✓ | Step# | Sym. | Description | From | To |
|---|---|---|---|---|---|
| | 2-41 | R17 | res., 33K, 2W | (C) V2#4 | G6 (C) |
| | 2-42 | C10 | cap., 250 mmf | (C) V2#4 | G6 (C) |
| | 2-43 | R16 | res., 10K, 2W | (S) V2#4 * | *TB1-1 (C) |
| | 2-44 | R13 | res., 470K | (C) V2#5 | G6 (S) |
| | 2-45 | C7 | cap., .5 mf | (S) V2#5* | *V1#8 (S) |
| | 2-46 | R29 | res., 330 Ω | (S) V2#3 | V2#6 (C) |
| | 2-47 | R14 | res., 820 Ω | (C) V2#8 | G5 (C) |
| | 2-48 | C8 | cap., .003 mf | (S) V2#8 | G5 (C) |
| | 2-49 | H28 | bare wire | (S) V2#1 | V2#2 (C) |
| | 2-50 | H28 | bare wire | (S) V2#2 | G5 (S) |
| | 2-51 | C9 | cap., 8 mf | (S) V2#6 * | *TB3#1 (C) |
| | 2-52 | H27 | hook-up wire | (S) H6#2 | G7 (C) |
| | 2-53 | H27 | hook-up wire | (S) G7 | C3 (S) |
| | 2-54 | H27 | hook-up wire | (S) TB3#1 | S3#RA (S) |
| | 2-55 | H28 | bare wire | (S) S3#1B | S3#1A (S) |
| | 2-56 | R28 | res., 1K, 2W | (S) TB1#1 | C5 (C) |
| | 2-57 | R25 | res., 1800 Ω, 5W | (S) G8 | * TB4#1 (C) |
| | 2-58 | R23 | res., 1MΩ | (C) TB4#1 | V4#5 (C) |
| | 2-59 | R24 | res., 330 Ω, 1W | (S) TB4#1** | *V4#8 (C) |
| | 2-60 | R18 | res., 470KΩ | (C) TB4#2 | G9 (C) |
| | 2-61 | H28 | bare wire | (S) V3#3 | G9 (S) |
| | 2-62 | R19 | res., 470KΩ | (C) TB4#2 | V3#1 (S) |
| | 2-62 | C11 | cap., .25 mf | (S) TB4#2 | *S3#2A (S) |
| | 2-63 | H27 | hook-up wire | (S) C13 | V3#6 (C) |
| | 2-64 | R20 | res., 3.3KΩ | (S) V3#6 | V3#2 (C) |
| | 2-65 | H28 | bare wire | (S) V3#2 | V3#4 (S) |
| | 2-66 | H27 | hook-up wire | (S) C5 | V4#4 (C) |
| | 2-67 | H28 | bare wire | (S) V4#4 | V4#3 (S) |
| | 2-68 | H28 | bare wire | (S) V3#8 | G10 (S) |
| | 2-69 | C12 | cap., 8 mf | (C) V3#5 * | *S3#2B (S) |
| | 2-70 | R21 | res., 15KΩ | (S) V3#5* | TB1#1 (S) |
| | 2-71 | H28 | bare wire | (S) V4#7 | G11 (S) |
| | 2-72 | C14 | cap., .25 mf | (S) V4#5 * | *R22#2 (S) |
| | 2-73 | H17 | ground lug | under R22 | R22#1 (S) |
| | 2-74 | H27 | hook-up wire | (S) R22#3 | S3#RB (S) |
| | 2-75 | H27 | hook-up wire | (S) V5#1 | S1#1 (S) |
| | 2-76 | H27 | hook-up wire | (C) V5#4 | S1#2 (S) |
| | 2-76 | H27 | hook-up wire | (S) V1#7 | H5#1 (S) |
| | 2-77 | H28 | bare wire | (S) H5#2 | H5#3 (S) |
| | 2-78 | H29 | line cord ** | | V5#4 (S) |
| | 2-79 | H29 | line cord ** | | V5#6 (S) |
| | 2-80 | C15 | cap., 20 mf | (S) V4#8 * | *J1 (C) |
| | 2-81 | R26 | res., 10K | (S) J1 | J2 (S) |

* With spaghetti




## WIRING OF THE MAIN TUNING CONDENSER

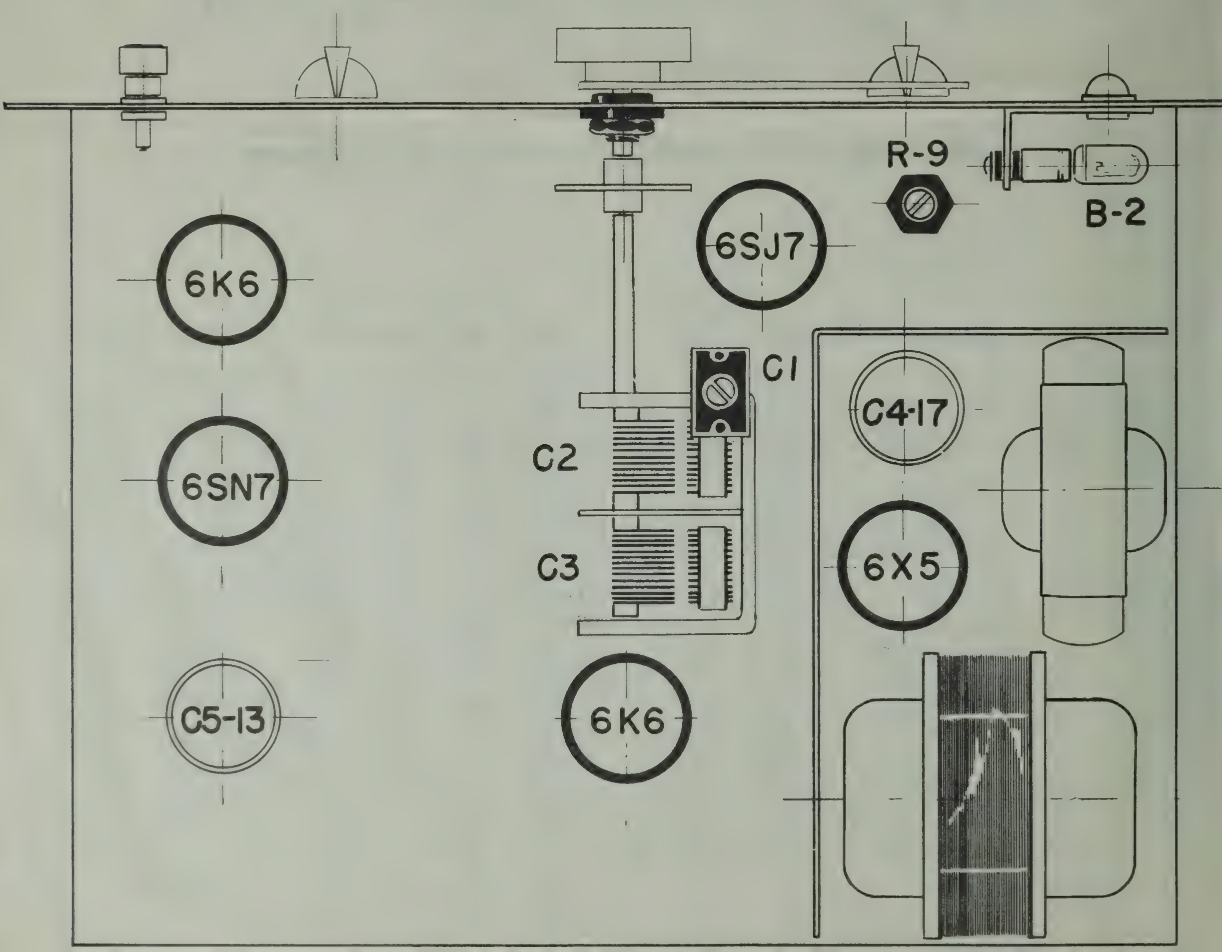
| √ | Step# | Sym. | Description | From | To |
|---|---|---|---|---|---|
| | 3-1 | C1 | ** 80 mmf trimmer cond. | (S) H11 | (S) C2 |

**Solder 2 1/2" length of heavy bare wire (H16) to ground lug H11. Be sure that H11 is not shorted to the chassis. Place C1 in position so that the heavy bare wire passes through the terminal lug at one end and the other terminal lug rests on the contact of C2. Solder at both ends. Be sure that C1 is well away from the frame of the main tuning condenser.

## FINAL STEPS

You have now finished the mechanical assembly and wiring of your instrument. When you have completed the following steps, your instrument will be in operating condition.

1. Screw the 3 watt lamp (B1) into its socket (H6) on the bottom side of the chassis.
2. Insert the tubes and pilot light as shown in the figure below.



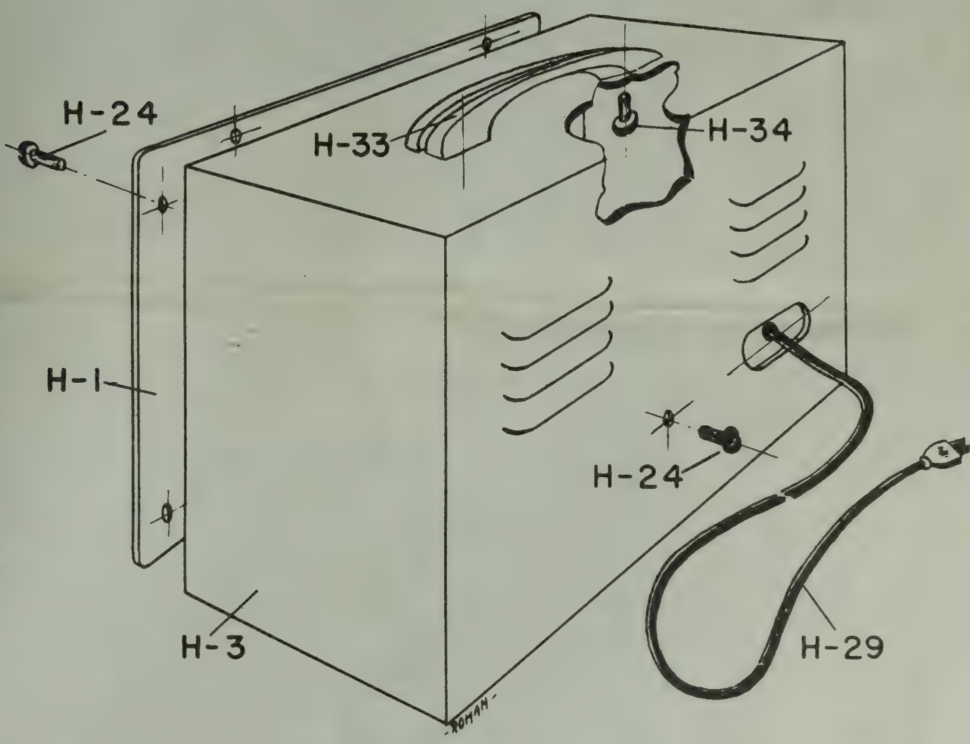
3. Make a careful examination of the entire chassis to determine whether all joints are soldered properly (no rosin joints), and that there is no rosin between tube socket lugs or switch contacts to cause leakage. Make sure that there are no loose lumps of solder in the chassis that may result in shorts. Also straighten out the wiring and the components so that there are no accidental shorts.

4. If you have an ohmmeter, measure the resistance from pin 8 of V5 to ground (before connecting the instrument to the power line). You will notice that the ohmmeter reading increases steadily as the ohmmeter battery charges the filter condensers of the unit. The final reading should be at least 35,000 ohms. If the reading is less than ~~100,000~~ ohms, DO NOT TURN THE INSTRUMENT ON, but carefully recheck the wiring of the power supply circuit.

5. Measure the resistance from the frame of the main tuning condenser to ground. When the BAND switch is set at band A, this resistance should be 18 megohms. If the resistance is much lower, check the fibre washers that insulate the condenser frame from the chassis.

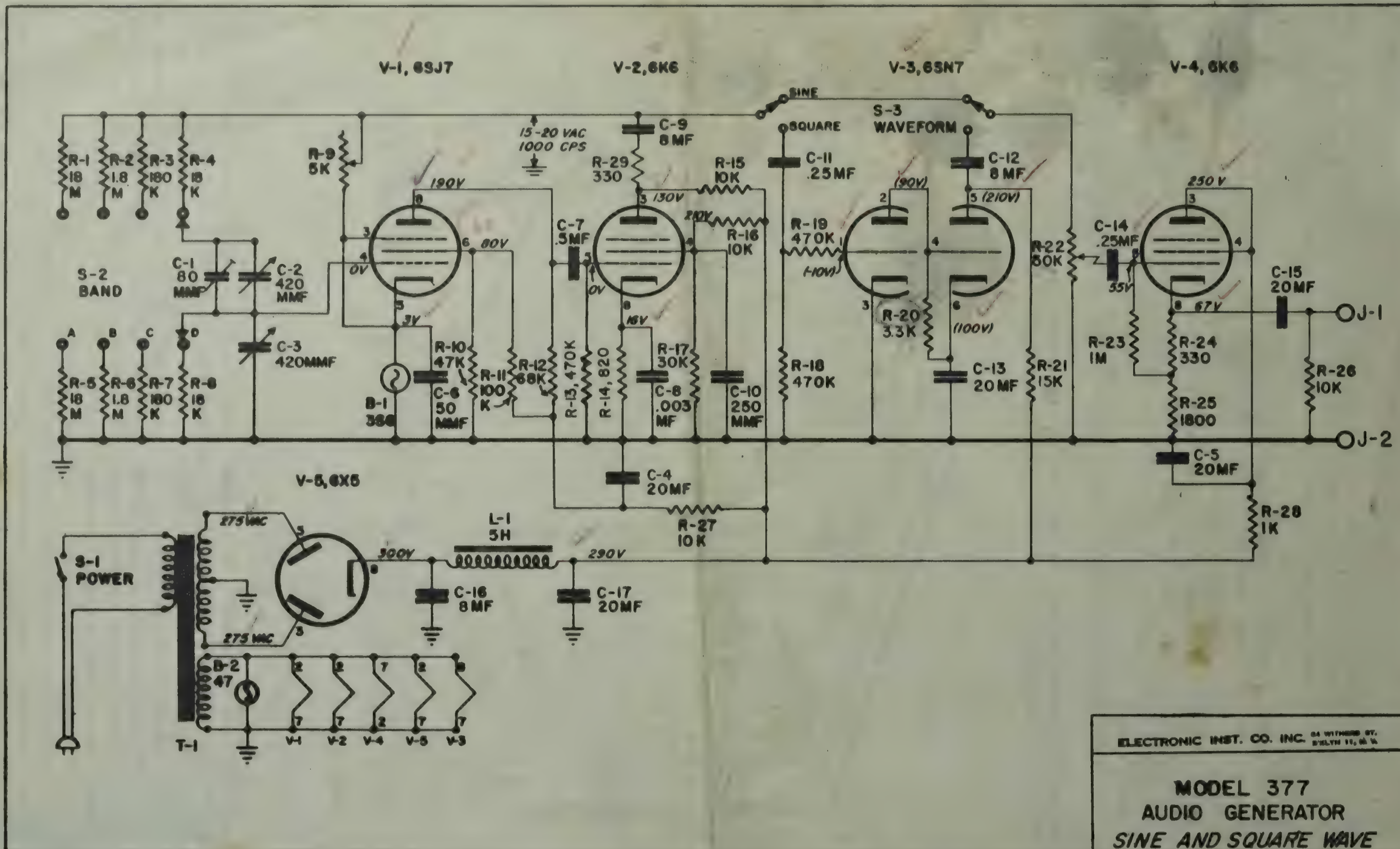
6. Calibrate the instrument by one of the three methods described in the MAINTENANCE section of the Instruction Book.

7. Mount the handle on the cabinet with the two #10-24 X 1/4" screws (H34). Insert the chassis in the cabinet, securing it with the #6 X 1/4" P.K. screws (H24). Both of these steps are shown in the figure below.



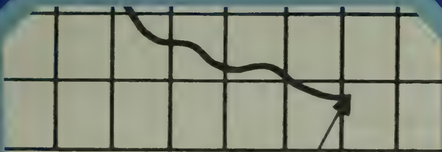

If the instrument fails to operate properly, make certain that the wiring and the components in the circuit are correct. Almost all troubles reported to us in the past, have had improper wiring as their cause. If the wiring is correct, test for continuity and check individual components for breakdown. If you have a high input impedance VTVM, such as the EICO Model 214 or 221, check the voltages shown on the schematic diagram. The voltages shown in parenthesis are measured with the WAVEFORM selector switch set at SQUARE. The other voltages are measured with the WAVEFORM selector switch set at SINE. All voltages may vary from the values shown by as much as 20%. Failure to obtain the proper voltages at any point should indicate where to look for the trouble.

If you are still having difficulty, write to our engineering department (Electronic Instrument Co., Inc., 33-00 Northern Blvd., L.I.C. 1, New York) listing all indications which might be helpful. If desired, you may return the instrument to our factory, where it will be placed in operating condition and calibrated for $5.00 plus the cost of parts replaced due to their being damaged in the construction of the instrument. Pack the unit very carefully; in the original shipping carton, if possible. Send it to the above address, prepaid Railway Express. The instrument will be returned as soon as possible, express collect.




# Model 377 AUDIO SINE AND SQUARE WAVE GENERATOR EICO

# INSTRUCTION MANUAL FOR



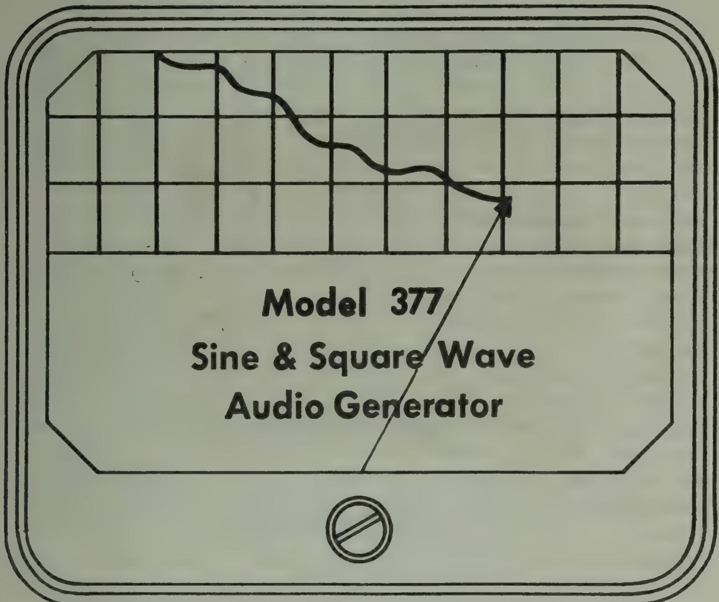
## Model 377
## Sine & Square Wave Audio Generator

EICO

ELECTRONIC INSTRUMENT CO., Inc.

33-00 NORTHERN BLVD. LONG ISLAND CITY 1, N. Y.

# INSTRUCTION MANUAL FOR




EICO

**ELECTRONIC INSTRUMENT CO., Inc.**

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## GENERAL DESCRIPTION

The EICO Model 377 is an audio sine and square wave generator providing sine wave voltages throughout the frequency range of 20 to 200,000 c.p.s. and useful square wave voltages throughout the frequency range of 60 to 30,000 c.p.s. The entire frequency spectrum is covered in four ranges, providing a long effective scale length for maximum accuracy and readability. A linear 0 to 100 scale is also provided for reference purposes.

The 377 is an adjustable vacuum-tube oscillator utilizing the widely-accepted resistance-capacitance tuning circuit that has been used for years in the finest laboratory generators. The frequency of oscillation is controlled with a capacitance-resistance filter (Wien Bridge) in a circuit which is highly degenerative except at the pass frequency of the filter; the circuit oscillates at this frequency. The Wien Bridge is composed of 1% precision resistors and a large 2 gang tuning condenser for accurate frequency determination and wide-band coverage. This generator possesses a high degree of frequency stability and requires a very short warm-up time to attain stable operation. The harmonic distortion in the output is less than 0.5%, giving a purity of waveform equalled only by the finest power generating stations. Although this instrument provides only sine and square waves, any desired waveform can be produced with an external R-C circuit (inserted between the generator and the load).

A cathode follower output circuit enables the instrument to deliver at least 10 volts across a 1000 ohm load (100 milliwatts) and to maintain high output without appreciable distortion when feeding into larger loads. The frequency response is flat ± 1.5 db from 60 c.p.s. to 150 Kc. The hum is kept down to less than 0.4% of the rated output by a full wave rectifier and a pi type LC filter, plus additional RC filtering.

This instrument will prove itself extremely useful in determining radio receiver fidelity and loudspeaker response, audio amplifier testing and design, and for square wave testing of television receivers.

## SPECIFICATIONS

Sine Wave Range: 20 - 200,000 c.p.s. in 4 bands; the dial can be read directly on all ranges.

| | |
|---|---|
| Band A: 20 - 200 c.p.s. | Band C: 2000 - 20,000 c.p.s. |
| Band B: 200 - 2000 c.p.s. | Band D: 20,000 - 200,000 c.p.s. |

Square Wave Range: 60 - 30,000 c.p.s. (5% tilt at 60 c.p.s., 5% rounding at 30 Kc). Read on same scales as sine waves.

Calibration Accuracy: ± 3% or 1 c.p.s., whichever is greater

Frequency Response: ± 1.5 db, 60 c.p.s. - 150 Kc

Output Voltage: The output circuit employed is of the cathode follower type. The table below gives the minimum output voltages that can be expected when the generator is feeding into different load impedances.

| | | | | |
|---|---|---|---|---|
| 1000 ohms | - | 10 volts | - | 1% max. distortion |
| 10,000 ohms and higher | - | 14 volts | - | 1% max. distortion |
| 500 ohms | - | 8 volts | - | 1.5% max. distortion |

These voltages are given for sine wave output and are unvarying with frequency; on square wave, the output voltages (r.m.s. values) are somewhat higher.

Rated Load: 1000 ohms (resistive)

Rated Output Power: 100 milliwatts into rated load (10 volts across a 1000 ohm resistive load).

Distortion: Less than 1% of rated output

Hum: Less than 0.4% of rated output

Power Requirements: 105 - 125 volts, 50 - 60 c.p.s., 50 watts

Tube Complement: 1 - 6X5, 1 - 6SJ7, 1 - 6SN7, 2 - 6K6
and 1 - 3S6 3 watt lamp (G.E. lamp designation)

Overall Dimensions: 11 1/8" long, 7 1/8" high, 7 5/8" deep

Weight: 20 pounds

Cabinet: Blue grey wrinkle lacquer on steel

Panel: 3 color, deep-etched, rub-proof

## OPERATING INSTRUCTIONS

1. PRELIMINARY STEPS: Insert the plug on the line cord into the a-c supply. Snap on the power switch (the pilot lamp should light), and allow a few minutes for the unit to warm up and begin to oscillate. If very accurate work is to be done, allow a ten minute warm-up for the unit to reach complete stability.

2. WAVEFORM SELECTION: Set the WAVEFORM selector switch to "SINE" or "SQUARE" as desired.

3. FREQUENCY SELECTION: Set the BAND selector switch to the desired frequency band. Each position on the BAND switch corresponds to a direct reading scale on the dial, as follows:

Band A: 20 - 200 c.p.s. Band C: 2 Kc - 20 Kc
Band B: 200 - 2000 c.p.s. Band D: 20 Kc - 200 Kc

Turn the frequency dial knob until the hairline on the indicator lines up with desired frequency (on the scale corresponding to the band selected). The linear 0-100 scale on the frequency dial is useful when it is required to repeat a given setting.

4. OUTPUT: The output voltage is obtained from the two terminal posts at the right hand side of the front panel. The lower of the two posts is grounded to the chassis.

Output power is varied by means of the attenuator control (marked AMPLitude) on the front panel. Clockwise rotation of the control knob increases the output power to its maximum value.

If a small signal voltage having a high signal-to-noise ratio is required, it is advisable to obtain it from a large signal voltage and an external voltage dividing network. This method is preferable because the noise in the generator output is constant (0.4% of rated output), and therefore a larger output has a higher signal-to-noise ratio which carries over to the small voltage taken from the dividing network. The voltage divider network shown below is suitable for most applications.

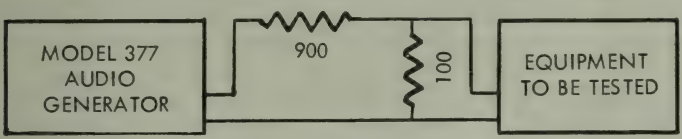



FIG. 1

Different sets of resistors may be used in the dividing network to obtain other voltage divisions. In all cases, however, the total of the two resistances should be at least 1000 ohms.

## APPLICATIONS

FREQUENCY MEASUREMENT: The Model 377 Audio Generator can be used to measure frequency by comparison.

WITH HEADPHONES: Connect the output of the Audio Generator to one of a pair of headphones. The signal of unknown frequency is fed to the other headphone. Put the headphones on and tune the generator for "zero beat". The reading on the tuning dial of the generator is the unknown frequency.

WITH AN OSCILLOSCOPE: Connect the Audio Generator to the horizontal axis of the 'scope. Then apply the unknown frequency to the vertical axis. The 'scope controls (or the input voltages) are now adjusted for roughly equal

deflections on each axis. Vary the frequency of the Audio Generator until the 'scope pattern is a stationary ellipse, a circle, or a diagonal line of fixed length. The shape of the pattern depends on the phase relationship between the known and unknown signals (See Fig. 2). The unknown frequency is now equal to the frequency of the Audio Generator as read on the tuning dial. Non-sinusoidal waves will produce distorted forms of a single loop pattern or a diagonal line of uneven brightness.

0° 45° 90° 135° 180°

FIG. 2

Frequencies out of the Audio Generator's range can be measured by means of Lissajous figures. Lissajous figures are stationary closed-loop patterns that appear on the screen when the frequency applied to one set of plates is a whole number of times larger than the frequency applied to the other set of plates, or if one frequency is a simple fraction of the other. To determine frequency ratio from the Lissajous figure, count the number of points of tangency to horizontal and vertical lines, drawn or imagined (See Figures 3a, 3b, 3c, 3d, 3e, and 3f). Points of tangency at the top of the figures result from the unknown frequency applied to the vertical axis. Those at the side of the figure result from the known frequency of the Audio Generator applied to the horizontal axis. As a matter of fact, the following relationship holds true in all cases:

$$\frac{\text{Frequency applied to the vertical axis}}{\text{Frequency applied to the horizontal axis}} = \frac{\text{Horizontal points of tangency}}{\text{Vertical points of tangency}}$$

As an example, take Fig. 3c, which shows four points of tangency at the top and one point at the side. This indicates that the unknown frequency applied to the vertical axis is four times the known frequency. In Fig. 3f, one point of tangency at the top and four at the side indicate that the unknown frequency is one fourth the known frequency.

2:1 3:1 4:1 1:2 1:3 1:4

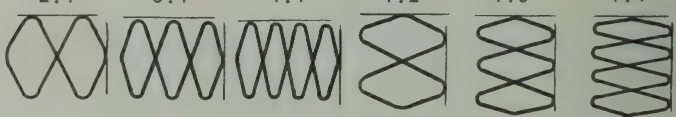


FIG. 3a 3b 3c 3d 3e 3f

SQUARE WAVE TESTING: The square wave signal provided by the Model 377 Audio Generator can be used to check amplifiers as to frequency response, phase shift, transient response, deficient design, or faulty components. In addition to the generator, an oscilloscope with sufficiently wide frequency response is needed to carry out the tests. The equipment is set up as shown in Fig. 4.

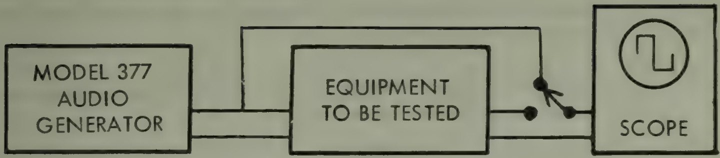



FIG.4

First, as a means of comparison, the square wave output from the Audio Generator is viewed on the 'scope. The horizontal sweep of the 'scope should be adjusted so that at least two full cycles can be seen on the screen. (Fig. 5a shows one full cycle of a perfect square wave). The 'scope is then connected to the output of the amplifier under test so that the modified square wave can be viewed on the screen. Possible output wave shapes are shown in Fig. 5b to 5i, and the significance of each wave shape is explained below.

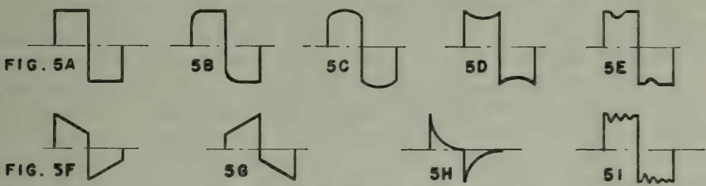



Fig. 5b shows "rounding" of the leading edge of the square wave. This indicates a drop off in gain at high frequencies. "Rounding" will generally be observable when there is a substantial drop in the gain by the tenth harmonic (or less). Therefore, if a 2 Kc square wave fed to the amplifier is reproduced on the 'scope without "rounding", the amplifier is flat to 10 X 2 Kc = 20 Kc.

Fig. 5c shows the effect of increased gain and Fig. 5d shows the effect of decreased gain at the square wave frequency. Fig. 5e indicates lowered gain at a narrow frequency band. If the square wave frequency is brought into this narrow frequency band, Fig. 5d will result.

The effect of phase shift in the amplifier is shown in Figs. 5f and 5g. If, at low frequencies, there is phase shift in the leading direction, the square wave will be tilted as in Fig. 5f. If there is phase shift in the lagging direction, the top of the square wave will be tilted as in Fig. 5g. The steepness of the tilt is proportional to the amount of phase shift. Phase shift is not important in audio amplifiers, although the ear is not entirely insensitive to it. In television and 'scope amplifiers, however, phase shift should not be tolerated.

Fig. 5h shows the pulse output from the amplifier that results when the square wave has undergone differentiation. This will happen when the grid resistor or the coupling condenser is too low in value or if the coupling condenser is partially open. Lastly, Fig. 5i, shows a square wave with damped oscillations following the leading edge. This results when a high frequency

square wave is fed to an amplifier in which distributed capacities and lead inductances resonate at low frequencies. In television and 'scope amplifiers it may result from an undamped peaking coil.

AUDIO AMPLIFIER RESPONSE: The set up for determining the frequency response of an audio amplifier is shown in Fig. 6.

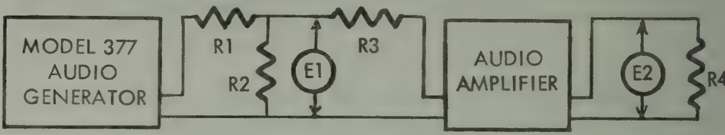



FIG.6

The voltage dividing network R1 and R2, is necessary when testing high gain amplifiers (see "OUTPUT" in OPERATING INSTRUCTIONS). For testing low gain amplifiers, connect the output of the Audio Generator directly to the amplifier input. The resistor R3 is in the circuit only when the input of the amplifier is a transformer, and the voltage dividing network is being used. The value of R3 should be equal to the input impedance of the amplifier.

The input voltage to the amplifier is E1. If the amplifier has a high input impedance and the resistances in the dividing network are known accurately, E1 may be determined by measuring the output voltage of the generator and multiplying it by $R2/(R1 + R2)$. This may be necessary when testing high gain amplifiers where the input voltages to the amplifier are very low and therefore difficult to measure.

The output of the amplifier should be fed to a load resistor of proper value, or to the speaker or other suitable apparatus. The output voltage is measured across the load resistor R4 or other suitable load.

The amplifier gain at any frequency is equal to the output voltage, E2, divided by the input voltage, E1. To obtain the data for a frequency response curve, measure the gain of the amplifier throughout the audio frequency range.

OVERALL RECEIVER FIDELITY MEASUREMENT: The set up for determining the overall fidelity of a radio receiver is shown in Fig. 7.

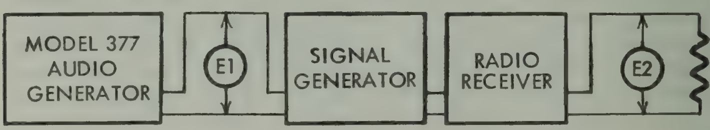



FIG.7

The Model 377 Audio Generator is used to modulate the output of an R-F Signal Generator that is connected to the antenna and ground terminals of the radio receiver under test. The output voltage of the Audio Generator should be

adjusted to produce about 30% modulation of the r-f signal.

Connect a voltmeter across the voice coil of the speaker. Set the R-F Signal Generator at 1000 Kc or to the desired frequency in the broadcast band, and then carefully tune the receiver to this frequency. Make sure that the receiver is exactly on resonance with the R-F Signal Generator frequency and not on one of the sideband peaks. Note that the output meter will show a maximum reading when the receiver is tuned to either of the sideband peaks on both sides of exact resonance. The receiver is tuned correctly when it is set at the point between the two sideband peaks where the output meter reading is a minimum. Data for an overall fidelity curve is obtained by recording the output voltage, E2, as the frequency of the Audio Generator is varied throughout the audio range (voltage E1 is kept constant).

## CIRCUIT DESCRIPTION

GENERAL: (See Fig. 8) The Model 377 Audio Sine and Square Wave Generator is a vacuum-tube oscillator of the resistance-capacitance type. It consists of a two tube oscillator that oscillates at the resonant frequency of the Wien Bridge frequency determining network inserted in the feed-back path. The oscillator is coupled to a cathode follower amplifier that acts as an isolation stage and as a power amplifier. The square wave is formed by a dual-triode clipping circuit that is inserted between the oscillator and the cathode follower stage when square wave output is desired.

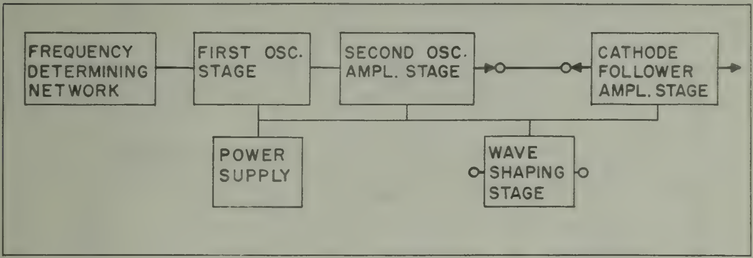



FIG. 8

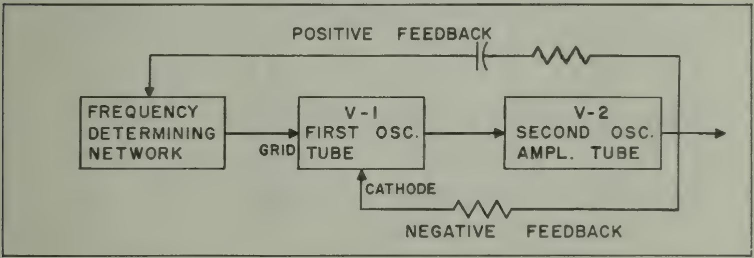



FIG. 9

THE OSCILLATOR CIRCUIT: (See Fig. 9) The oscillator section is basically a two tube amplifier with a Wien Bridge inserted in the feed-back path. It oscillates as a result of part of the output voltage being fed back to the input with the correct phase relation. This type of feed-back is known as positive feed-back. Negative feed-back is also employed to stabilize the oscillator operation and to maintain constant output over a wide frequency range.

THE FREQUENCY DETERMINING NETWORK: (See Figs. 10 and 11) The frequency determining network consists of two groups of variable capacitors and two groups of resistors wired to the band switch. Designating the resistor group R1-4 as R-S (in series with the associated variable capacitor) and R5-8 as R-P (in parallel with the associated variable capacitor), the values of R-S and R-P are fixed for each band. R-S and R-P are always equal in value, as are C-S and C-P.

The circuit design is such that the voltage applied to the first oscillator control grid is in phase with the voltage applied to the whole frequency determining network. In addition, the grid voltage is always one third of the voltage applied to the whole network. This is a characteristic of the Wien Bridge at resonance.

The resonant frequency of the network is inversely proportional to the product of resistance and capacity (R-S and C-S, or R-P and C-P). Large changes in resonant frequency are possible with each set of components. A frequency change of more than ten to one is achieved with each set of resistors, and the audio and supersonic spectrum is covered in only four bands.

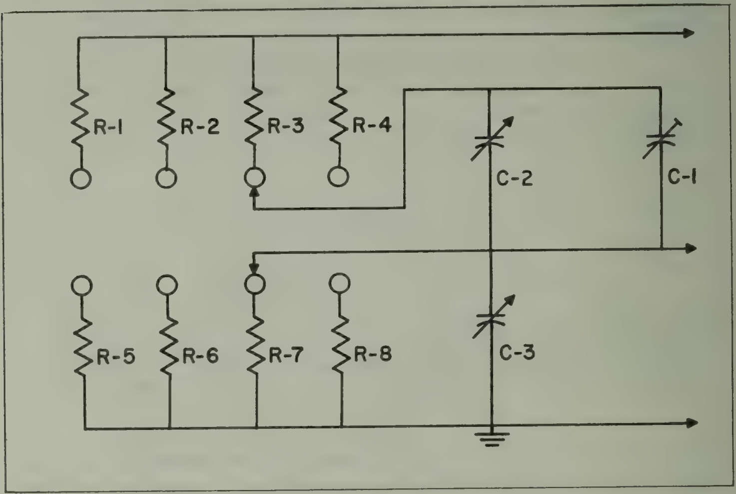



FIG. 10

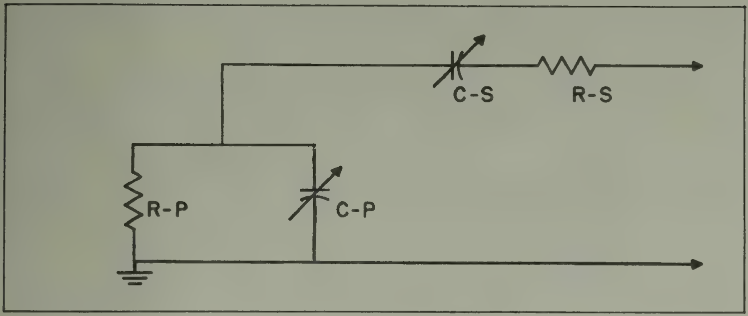



FIG. 11

NEGATIVE FEED-BACK AND AUTOMATIC AMPLITUDE LIMITOR: As may be seen in Fig. 12, the negative feed-back voltage used in the oscillator section is derived from the output of the second oscillator tube, V2, and is fed back to the cathode of the first oscillator tube, V1. The magnitude of the negative feed-back is determined by a resistor network, one element of which is the incandescent lamp, 3S6. A property of this lamp is that it has a positive temperature coefficient; however it possesses sufficient thermal inertia so that its temperature is substantially constant at all audio frequencies. Because of the lamp's positive temperature coefficient, the oscillations can not build up to a value in excess of the tube's handling capacity. This is so because the resistance of the lamp increases with increased current. As a result the degeneration in the cathode circuit of V1 increases, causing less amplification in the oscillator section. Thus, the lamp serves as an automatic amplitude limitor. Pot R9 is set at calibration for the proper negative feed-back.

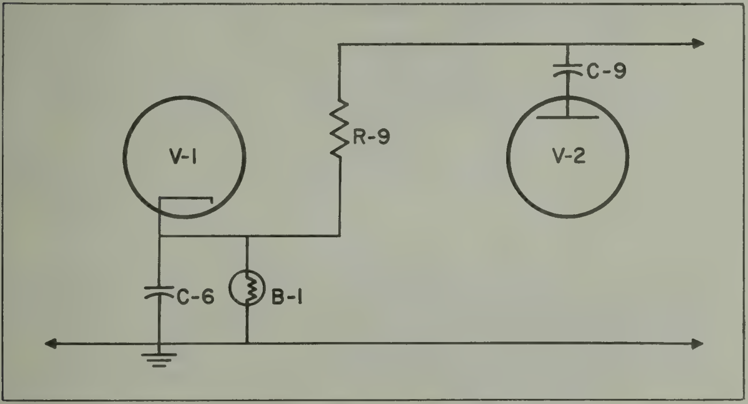



FIG. 12

THE SQUARE WAVE SHAPING CIRCUIT: (See Fig. 13) The square wave is formed from the sine wave output of the oscillator section. The sine wave is fed to the grid circuit of V3 (left-half), where grid limiting occurs. This is due to the flow of grid current through R19 on the positive half-cycles, causing a voltage drop across R19 opposing the original signal voltage. As this opposing voltage increases with increasing positive signal, clipping occurs and the waveform at the grid is as shown. While the grid waveform is independent of cathode-plate conduction through the tube, the plate waveform is not. As the grid voltage dips below the cut-off point on the negative half-cycles, cut-off limiting occurs and the negative half of the plate waveform is flattened. The right half of V3 follows the plate of the left half. In this section, the rounded bottom of the wave is clipped, and the resulting square wave amplified. The squareness of the wave is increased in both sections of the tube due to the non-linear tube characteristic.

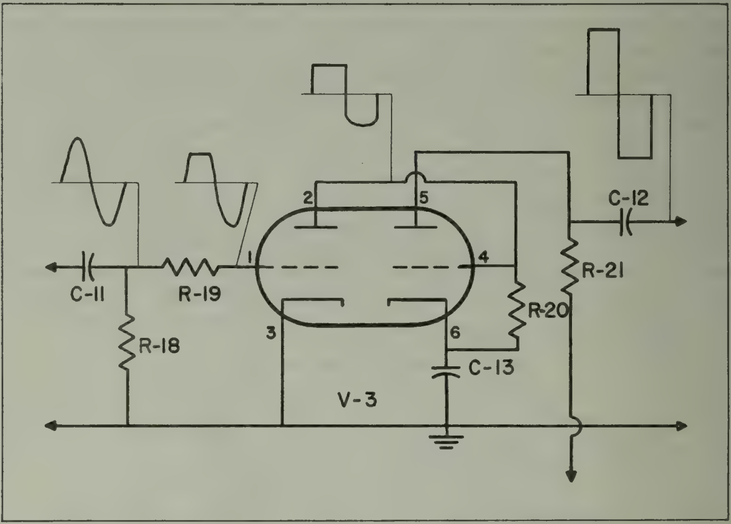



FIG. 13

THE CATHODE FOLLOWER OUTPUT CIRCUIT: (See Fig. 14) In this circuit, the voltage applied to the grid of tube, V4, varies the current through the tube, which in turn varies the voltage across the total cathode resistor (R24 and R25). The output voltage is taken out through the large capacitor, C15, which presents a very low impedance over the entire frequency spectrum. The cathode resistance is split into R24 and R25 to provide the proper bias.

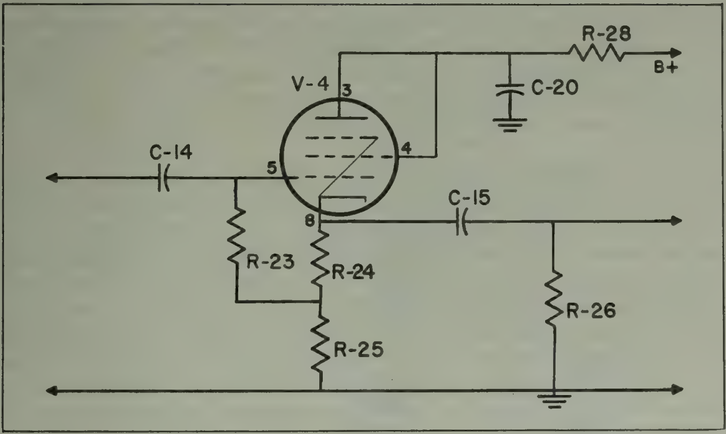



FIG. 14

THE POWER SUPPLY: The power supply is a conventional full wave rectifier circuit, employing a 6X5 tube (V5) and a pi filter consisting of a choke, L1, and two electrolytic capacitors, C16 and C17. This LC network effectively filters the d-c voltage output of the rectifier. The +B voltages for the first oscillator tube, V1, and the cathode follower tube, V4, are additionally filtered by RC circuits. R27 and C18 form an RC filter for V1, and R28 and C19 form an RC filter for V4.

## MAINTENANCE

CALIBRATION: The Model 377 is extremely stable. However, after a long period of use, it may require re-calibration due to aging of the components. The accuracy may be readily restored by using one of the methods below. Re-calibration will also be necessary whenever tubes or other components are replaced. Fig. 15 shows the locations of trimmer C1, pot R9, and the tubes.

The A-C Voltmeter method is satisfactory for general use of the instrument. The Oscilloscope method is preferable, however, as it gives better accuracy. The Frequency Standard method is necessary for work that requires very accurate knowledge of the frequency.

1. A-C VOLTMETER METHOD: This method requires only an a-c voltmeter, preferably one with 1000 ohms/volt sensitivity or more. The procedure is as follows: a) Connect a 1000 ohm resistor across the output terminals of the Audio Generator. b) Connect the a-c voltmeter across the resistor. c) Set the BAND switch at band B and the frequency dial at 200 c.p.s. d) Turn the AMPL. control to the maximum clockwise position. e) Adjust pot R9 for a reading between 10.5 and 11 volts(r.m.s.) on the meter. f) Turn the frequency dial knob to 2 Kc. g) Loosen or tighten the adjustment screw on

trimmer C1 with an insulated alignment tool until the voltage read on the meter is equal to the voltage read when the frequency dial knob was set at 200 c.p.s.

The instrument is now calibrated. As a check, turn the frequency dial knob back to 200 c.p.s., observing the meter as you do so. The voltage should be nearly constant over the entire frequency range.

2. OSCILLOSCOPE METHOD: This method requires an oscilloscope with a 60 cycle test output and an a-c voltmeter. The procedure is as follows: a) Adjust pot R9 as described in steps a, b, c, d, and e of the A-C Voltmeter method above. b) After pot R9 has been adjusted for a reading between 10 and 11 volts, disconnect the a-c voltmeter (leaving the 1000 ohm resistor). c) Connect the output of the Audio Generator to the vertical input terminals of the 'scope. d) Connect the 60 cycle test terminals of the 'scope to the horizontal input terminals. e) Set the BAND switch of the Audio Generator at band A, and turn the frequency dial knob to 180 c.p.s. f) Adjust the 'scope controls for roughly equal deflections on each axis. g) Loosen or tighten the adjustment screw on trimmer C1 with an insulated alignment tool until the Lissajous figure shown in Fig. 3b (for 3:1 ratio) appears stationary on the screen.

The instrument is now calibrated. As a check, turn the frequency dial knob to 20 c.p.s. The Lissajous pattern shown in Fig. 3e should appear on the screen. Turn the frequency dial knob to 60 c.p.s. One of the Lissajous patterns shown in Fig. 2 (for 1:1 ratio) should be obtained.

3. FREQUENCY STANDARD METHOD: This method requires either a standard audio generator with known accuracy or a fixed frequency standard. Before calibration, allow the Model 377 to heat up for at least thirty minutes. The calibration procedure is the same as described in the OSCILLOSCOPE method above. Instead of the 60 cycle test signal, however, the standard is connected to the horizontal plates of the 'scope.

If a standard generator is used, set it at a frequency of 2 Kc. Set the BAND switch of the Model 377 at band B, and the frequency dial knob at 2 Kc. Adjust the trimmer, C1, until one of the Lissajous patterns shown in Fig. 2 (for 1:1 ratio) appears stationary on the screen. The Model 377 is now calibrated. As a check, adjust the standard generator and the Model 377 to equal frequencies on their respective dials at two other points in band B and three points in each of the remaining bands. One of the Lissajous figures for 1:1 ratio should appear on the screen at each point, allowing for the specified accuracy of Model 377.

If a fixed frequency standard is used, set the Model 377 at a nominal frequency near the high end of band B that is in the ratio of a whole number or a simple fraction to the fixed standard frequency. Adjust the trimmer, C1, until the appropriate Lissajous figure appears stationary on the screen. The instrument is now calibrated. Check at least two other points on band B and three other points on each of the remaining bands by means of the appropriate Lissajous figures.

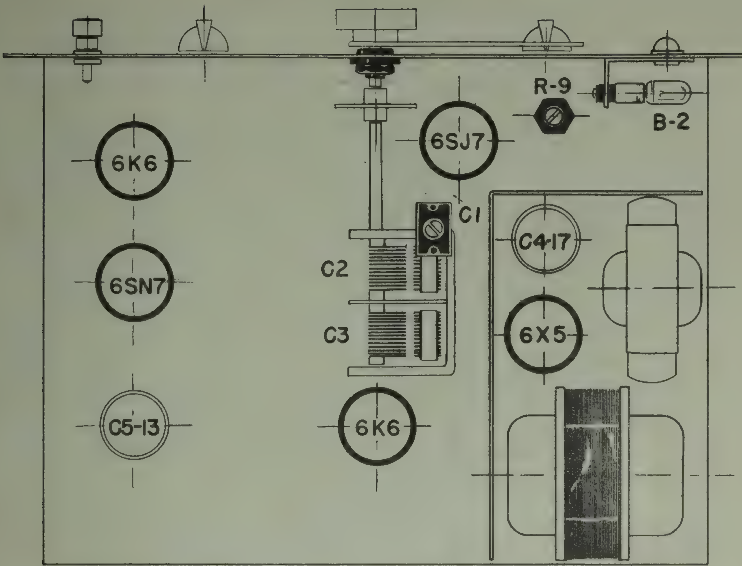



FIG. 15

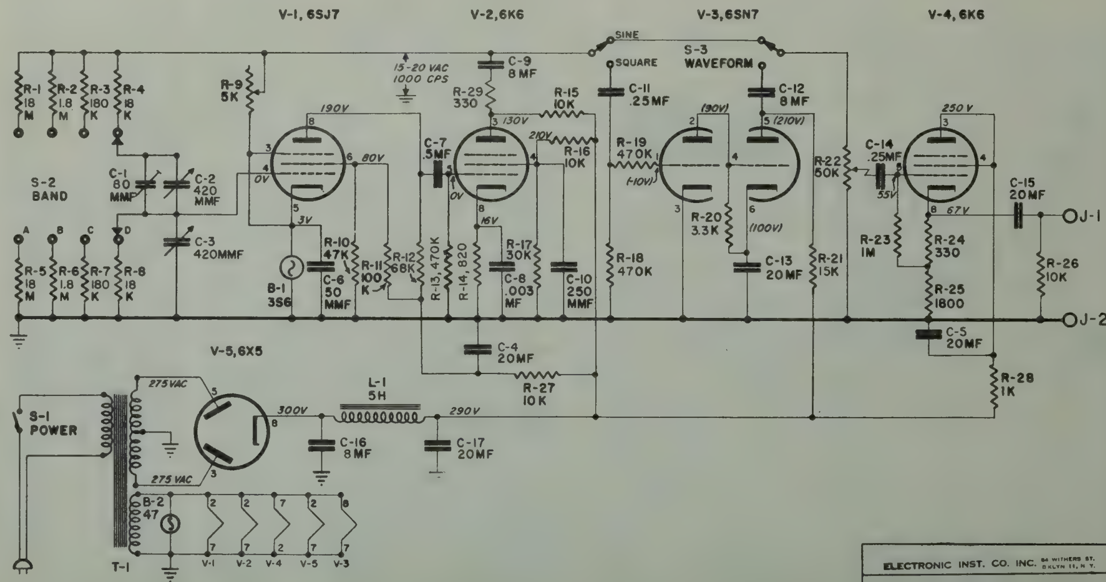
LAMP REPLACEMENT: The three watt lamp, B1, is never lit up in normal operation as it is operated below the level necessary for incandescence. As a result, it should have extremely long life. If, however, it becomes necessary to replace the lamp, it is required to check the a-c voltage from the arm of R9 to ground with the new lamp in place. This a-c voltage should be between 15 and 20 volts (r.m.s.), as measured with a high impedance vacuum-tube voltmeter, when the Audio Generator is tuned to 1000 c.p.s. If the voltage is not within this range, correct it by adjustment of pot R9. If the voltage cannot be brought within 15 to 20 volts with the new lamp in place, try another lamp instead.

INTERMITTENT OUTPUT: If the output is intermittent, check to see if the three watt lamp, B1, is flashing also. If it is, check for a short in the main tuning condenser. Clear out the short, but be careful not to bend the plates.

DISTORTION: Excessive distortion may result from a bad tube, a leaky coupling capacitor, an open by-pass capacitor, a defective electrolytic capacitor, low +B voltage, or too much output from the oscillator section of the circuit.

## EICO REPAIR SERVICE

If your instrument fails to function properly and the cause of the trouble is not apparent, you may return it to the EICO repair department where it will be repaired for a nominal charge.




ELECTRONIC INST. CO. INC. 84 WITHERS ST. BKLYN 11, N. Y.

MODEL 377
AUDIO GENERATOR
*SINE AND SQUARE WAVE*